VOLUME XLIX
NUMBER ONE

THE NATIONAL GEOGRAPHIC MAGAZINE

JANUARY, 1926

CONTENTS

TWELVE PAGES OF ILLUSTRATIONS IN FULL COLOR

On the Trail of the Air Mail
With 68 Illustrations
LIEUTENANT J. PARKER VAN ZANDT

Man's Feathered Friends of Longest Standing
With 35 Illustrations
ELISHA HANSON

Pigeons of Resplendent Plumage
12 Paintings from Life
HASHIME MURAYAMA

Measuring the Sun's Heat and Forecasting the Weather
With 16 Illustrations
C. G. ABBOT

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TO carry out the purposes for which it was founded thirty-seven years ago, the National Geographic Society publishes this Magazine. All receipts are invested in the Magazine itself or expended directly to promote geographic knowledge.

ARTICLES and photographs are desired. For material which the Magazine can use, generous remuneration is made. Contributions should be accompanied by an addressed return envelope and postage.

IMMEDIATELY after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. Four expeditions have followed and the extraordinary scientific data resulting given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures. As a result of The Society's discoveries this area has been created a National Monument by proclamation of the President of the United States.

AT an expense of over $50,000 The Society sent a notable series of expeditions into Peru to investigate the traces of the Inca race. Their discoveries form a large share of our knowledge of a civilization waning when Pizarro first set foot in Peru.

THE Society also had the honor of subscribing a substantial sum to the expedition of Admiral Peary, who discovered the North Pole.

NOT long ago The Society granted $25,000, and in addition $75,000 was given by individual members to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees of California were thereby saved for the American people.

THE Society is conducting extensive explorations and excavations in northwestern New Mexico, which was one of the most densely populated areas in North America before Columbus came, a region where prehistoric peoples lived in vast communal dwellings and whose customs, ceremonies, and name have been engulfed in an oblivion.

THE Society also is maintaining expeditions in the unknown area adjacent to the San Juan River in southeastern Utah, and in Yunnan, Kweichow, and Kansu, China—all regions virgin to scientific study.

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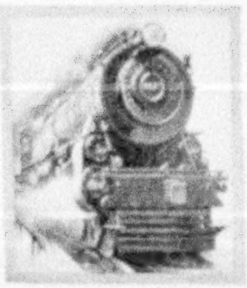

What time is it?

Does your watch answer that question as accurately as the watch of a railroad conductor?

THE conductor and the engineer of a crack train must know the exact time every mile of the way. Absolutely accurate time is also essential to the dispatcher and the signalman. In fact, every railroad man from switchman to high-salaried executive works continually by a watch of unfailing accuracy. What is the watch these men select?

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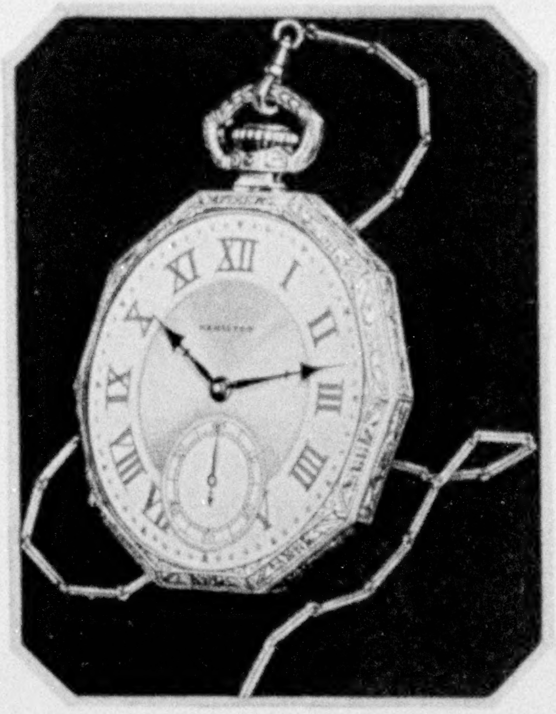

The new decagon design. Hamilton pocket watches may be had in yellow, white or green gold, 14k or filled, plain or engraved. Prices $48 to $685. You can choose from a wide variety of cases and dials.

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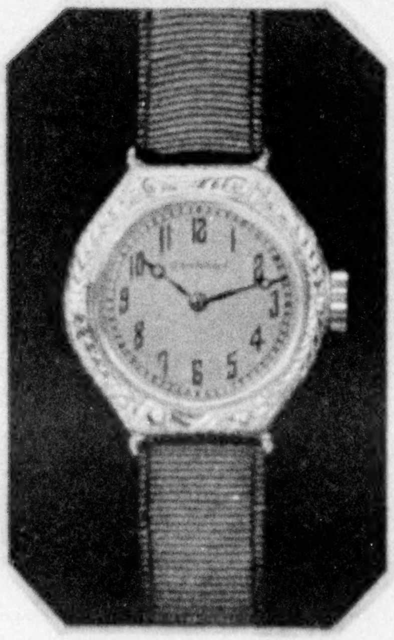

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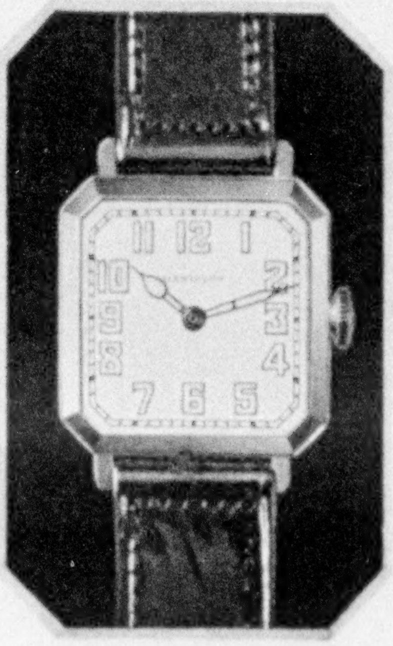

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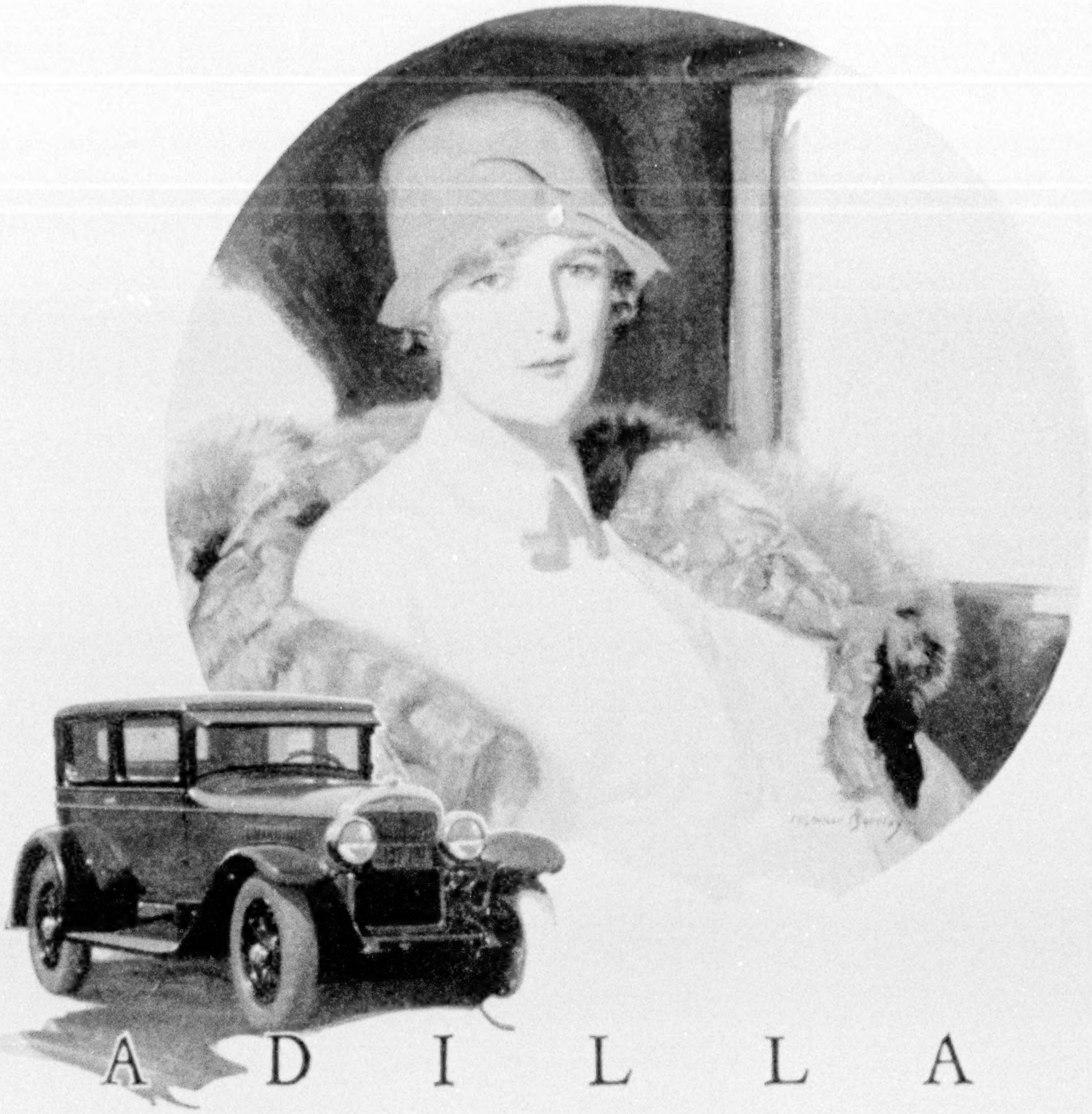
The Watch of Railroad Accuracy



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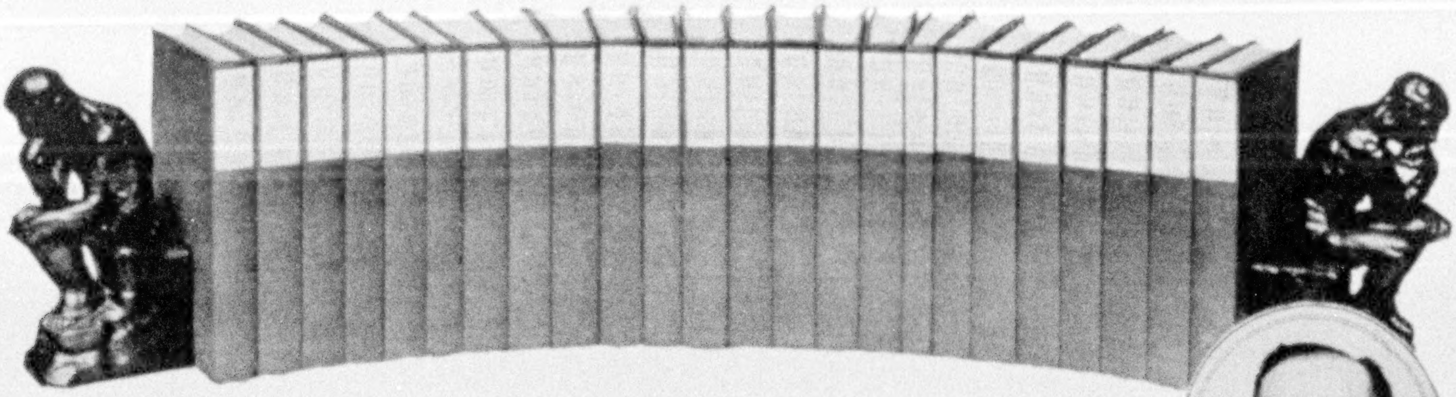

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He had met, too, these strange and ever-bewitching women who move through his pages. They were real people, all of them; he knew their lives, their "stories." And what breathless narratives they are! "Such tales as men tell under the haunting stars"—that, in a phrase, typifies them.

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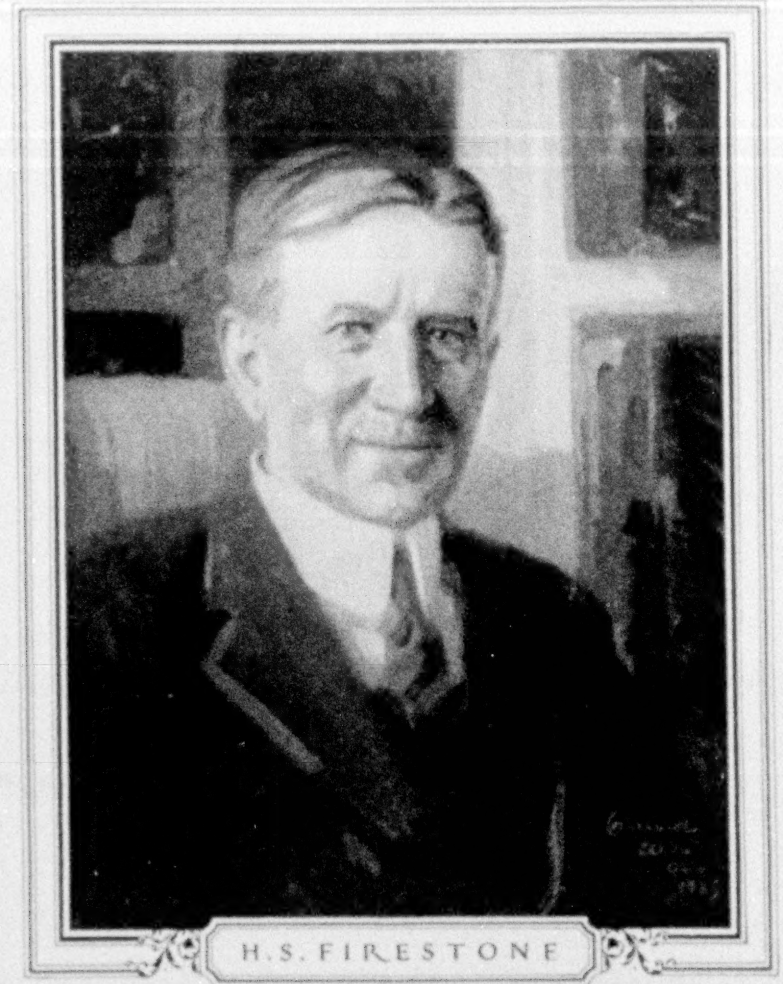

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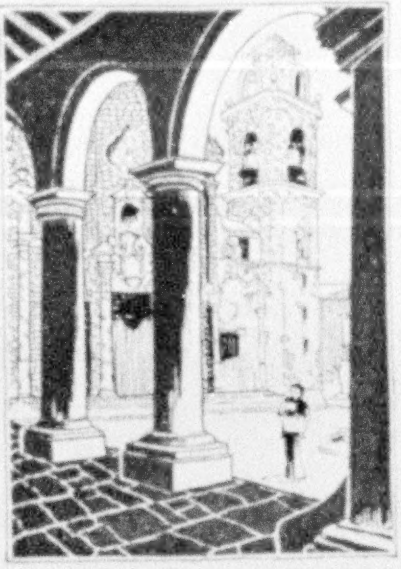

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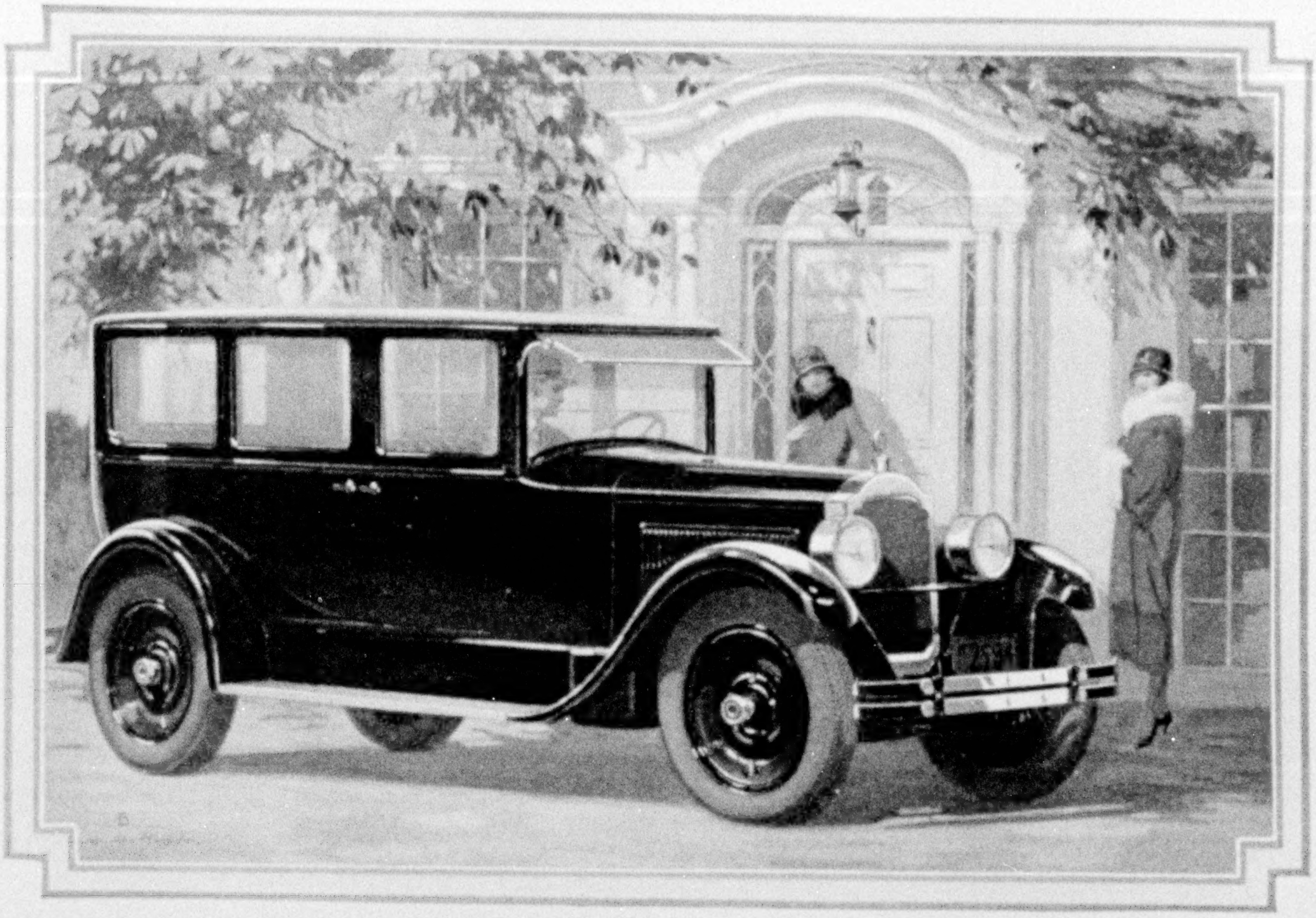

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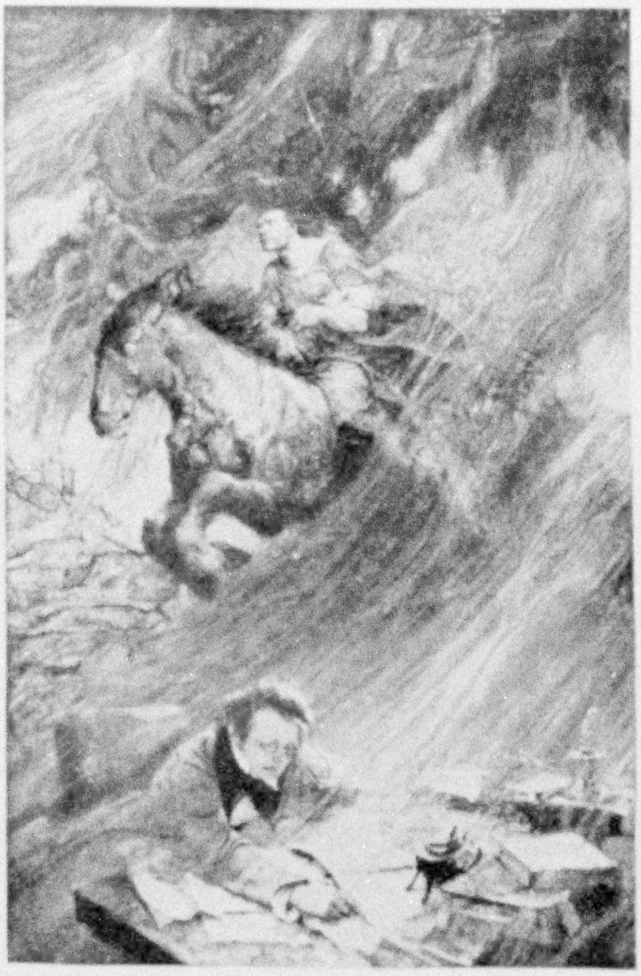

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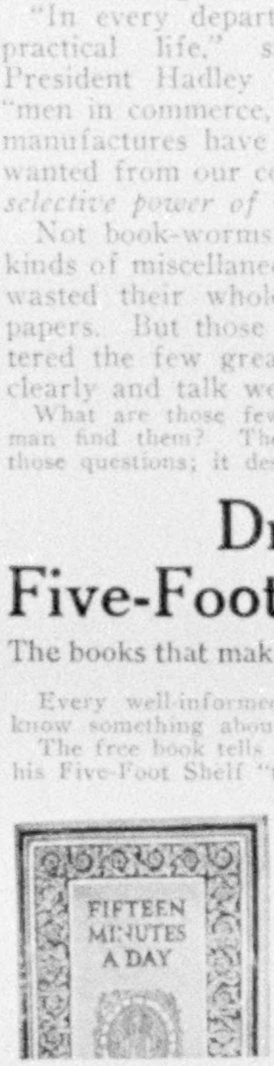

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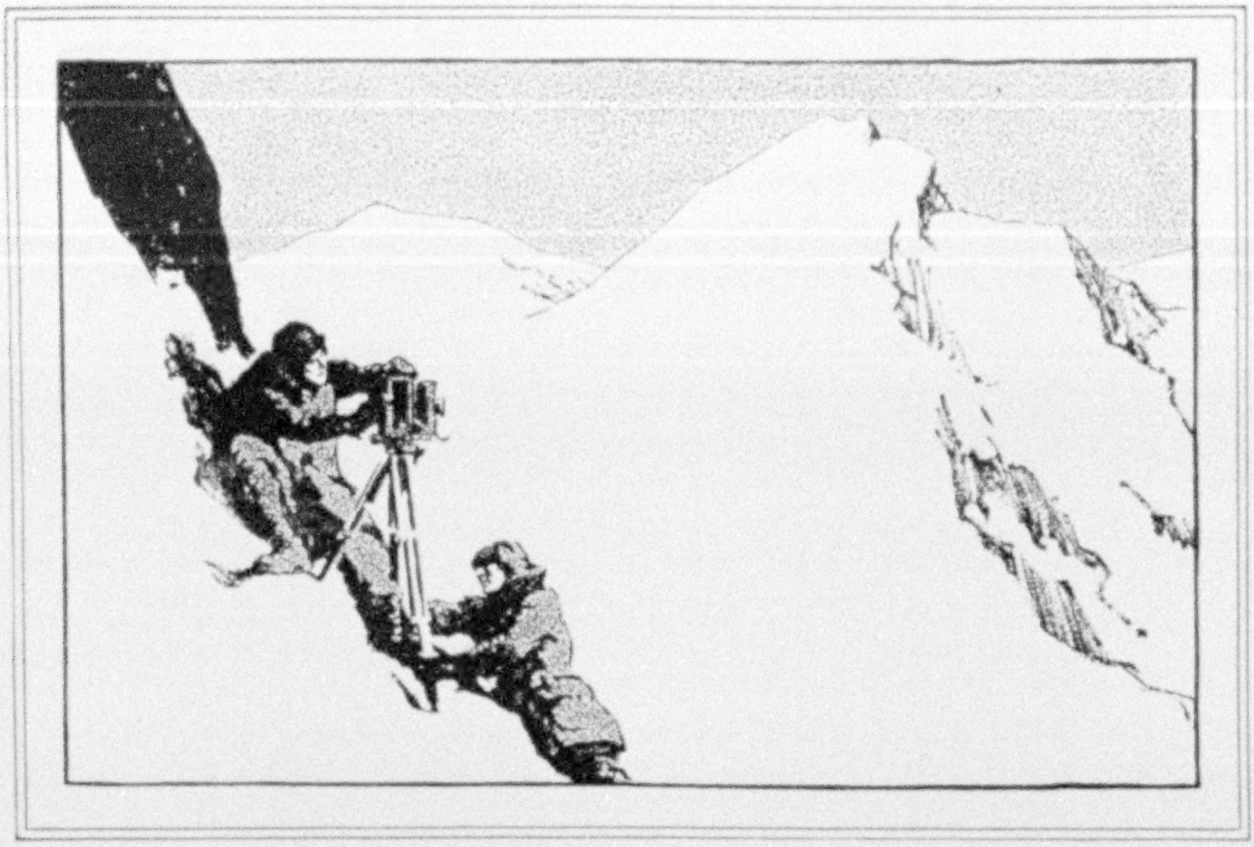

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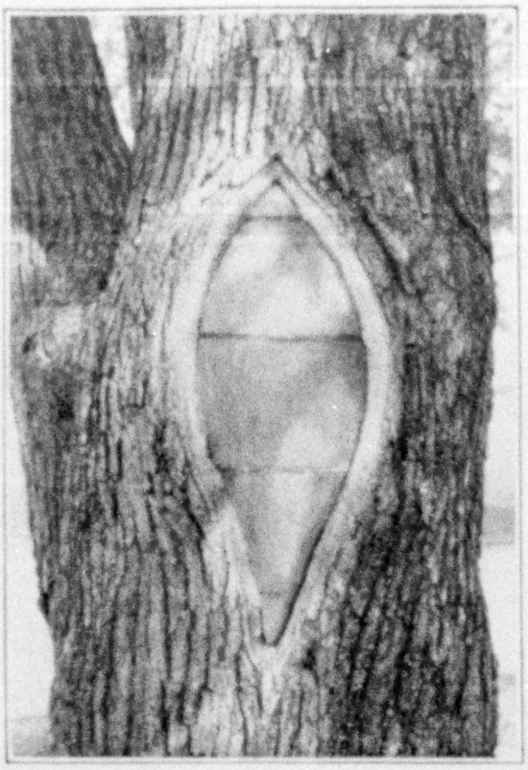

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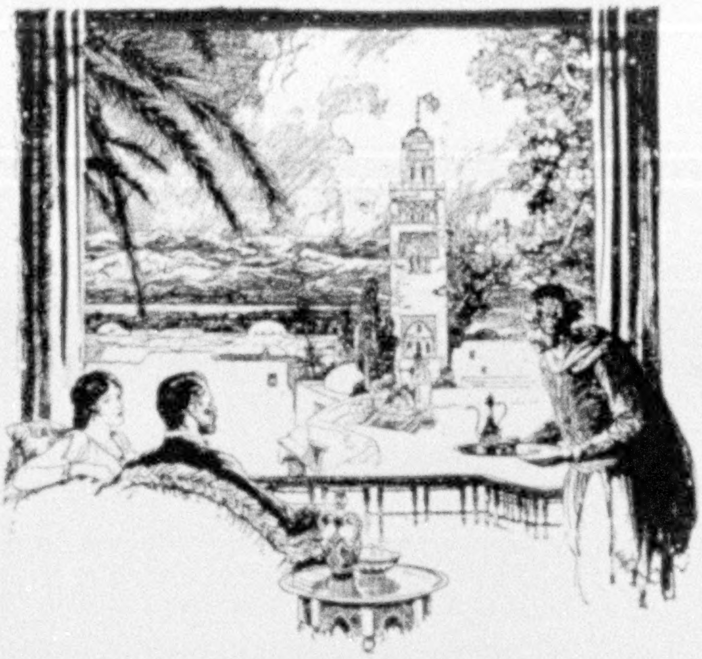

Summer, Mystery and Morocco

Only Nine Days from New York

LONG centuries past, swarthy tribes wandered through the trackless desert down to today. And, under the star dusted canopy of the Sahara, they still pitch their striped tents. Too, there was a great teacher who told of Allah. Now, many mosques, exquisitely decorated, point their slender minarets upward into the Mussulmans' heaven.

It's North Africa of a thousand years ago . . . and today! It is perpetual summertime . . . an exotic story in vivid colors held together by thousands of miles of macadam highway and 31 famous Transatlantique hotels.

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Six days from America to Europe on a French Liner. No transferring to tenders at Havre. Three hours on a special boat train to Paris. Overnight, the fashionable Riviera. And but little more than a day distant . . . at the far end of "the longest gangplank in the world" . . . the past lives again.

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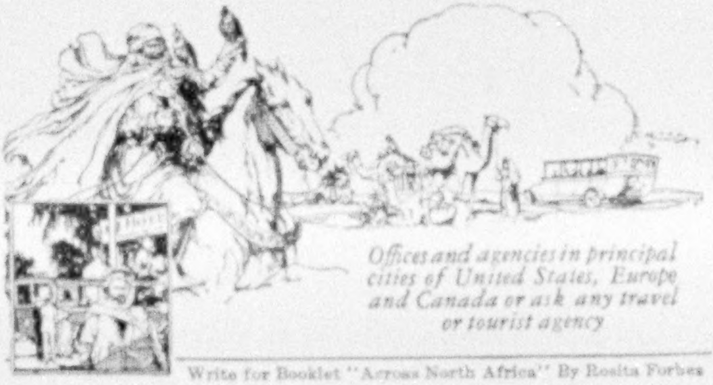

Offices and agencies in principal cities of United States, Europe and Canada or ask any travel or tourist agency

Write for Booklet "Across North Africa" By Rosita Forbes

When this dredge started work the Mayor of Nome, Alaska, declared a holiday and all of the inhabitants attended.

The "Forty-Niner" of '26

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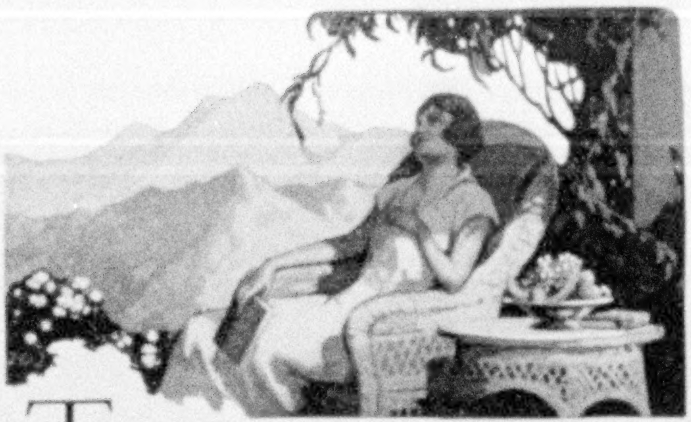

They say it's a MIRACLE climate!

El Paso
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MANY who have traveled the world over in search of health now come regularly to El Paso because they say they have found it a veritable *"miracle climate"*. They find that our 331 mild, sunny days and the clean, dry air of this moderate altitude bring relief—often speedy recovery—from tuberculosis, bronchitis, asthma and the lowered conditions which often cause these maladies.

We have a high record of recoveries to substantiate this theory and we want everyone interested to know about El Paso. *"Filling the Sunshine Prescription"* is our booklet in which you, or perhaps someone you know, will be very much interested. It is free. Just mail the coupon.

This year try El Paso. All railways allow free 10-day stop-over en route to Pacific Coast points. If you drive remember Southwestern, Ozark and Old Spanish Trails all lead into El Paso—also Lee and Bankhead Highways.

El Paso *Gateway Club*
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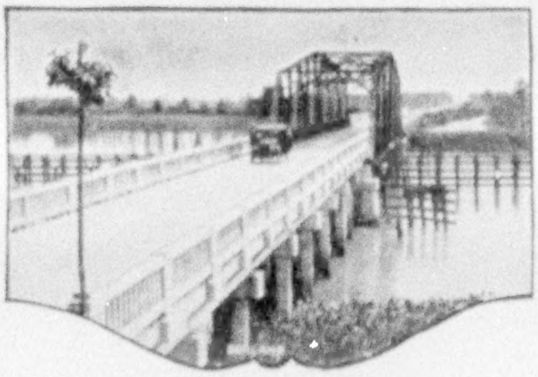

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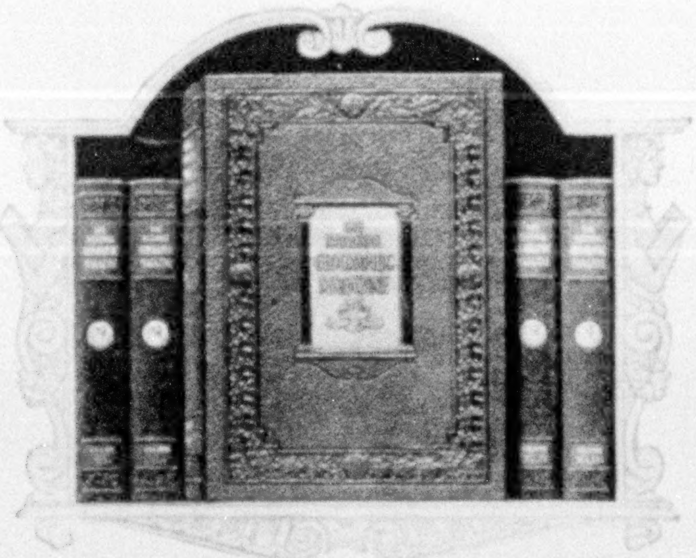

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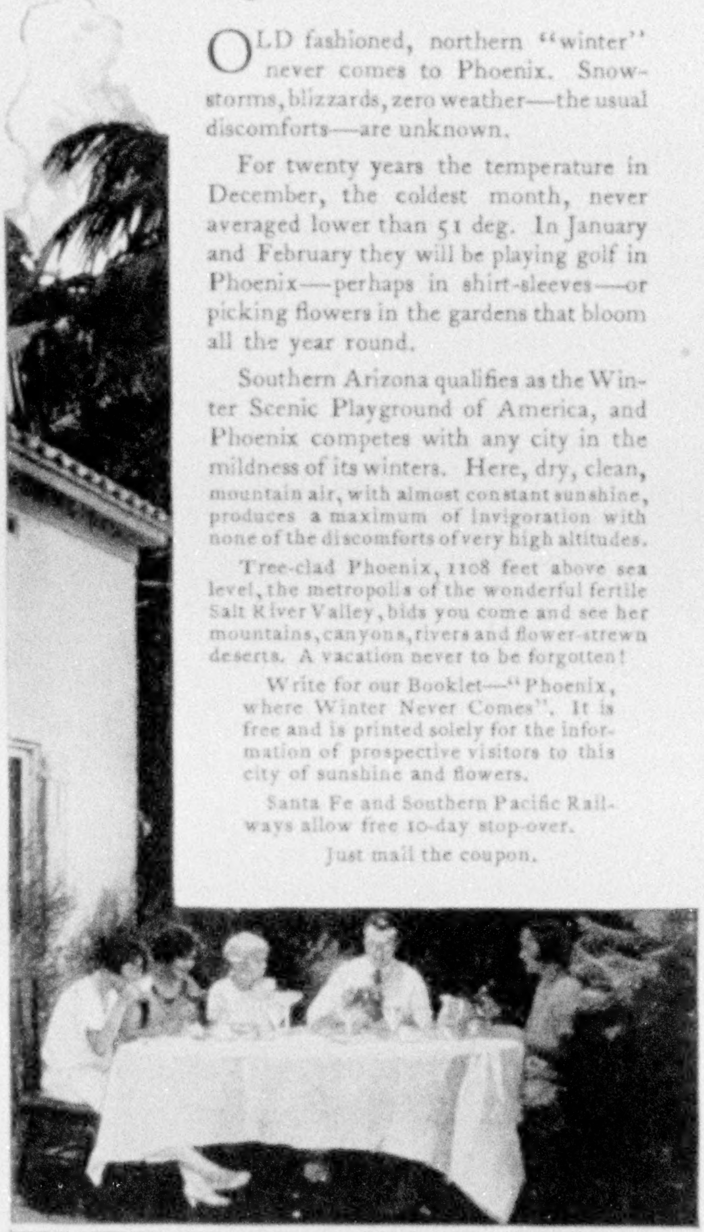

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16

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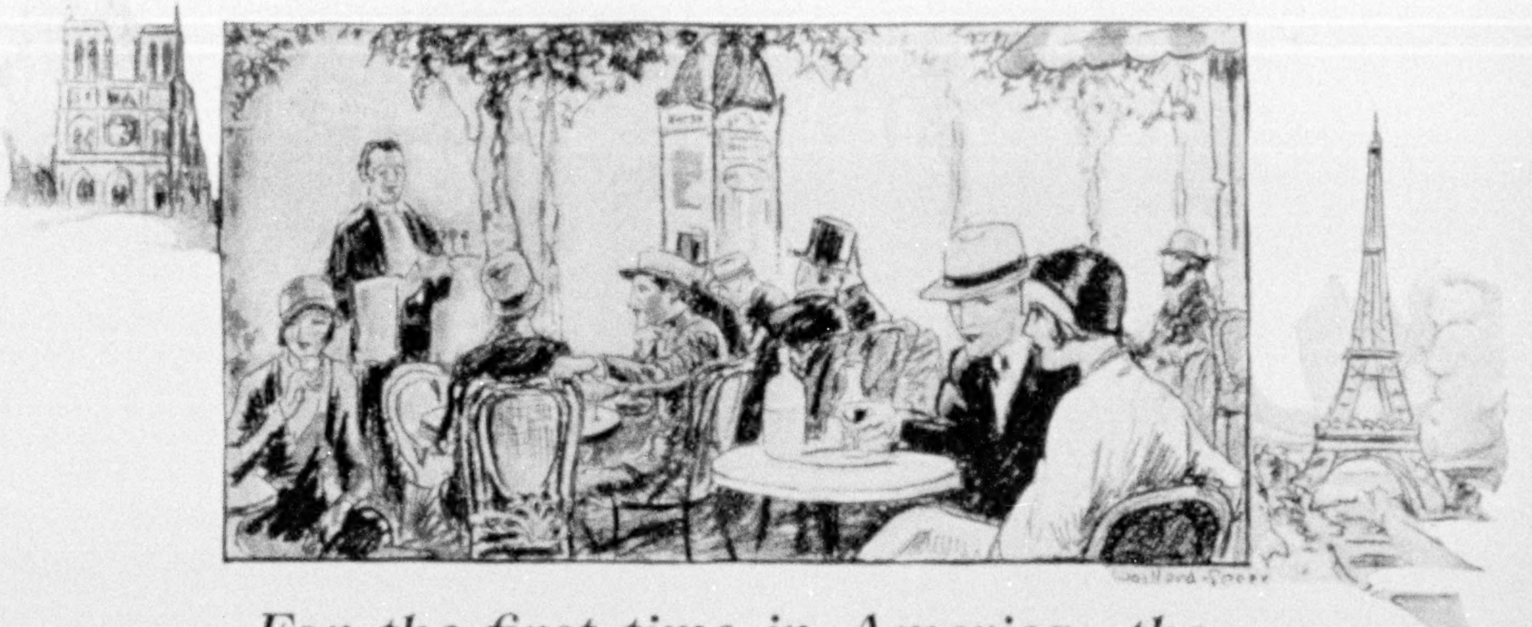

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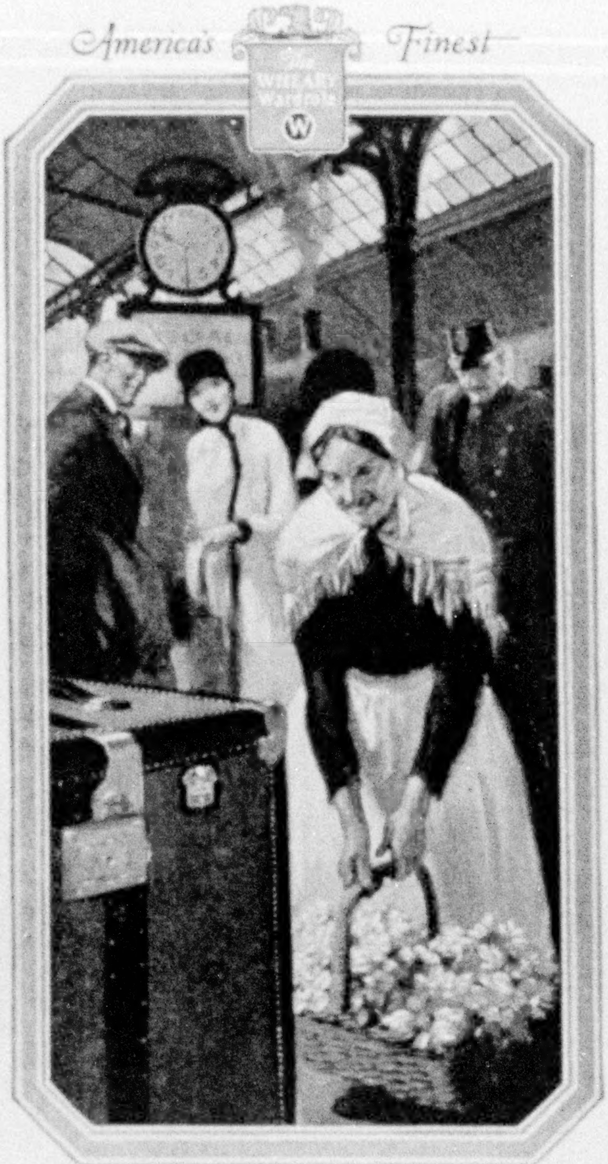

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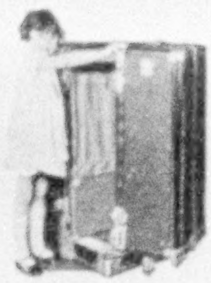

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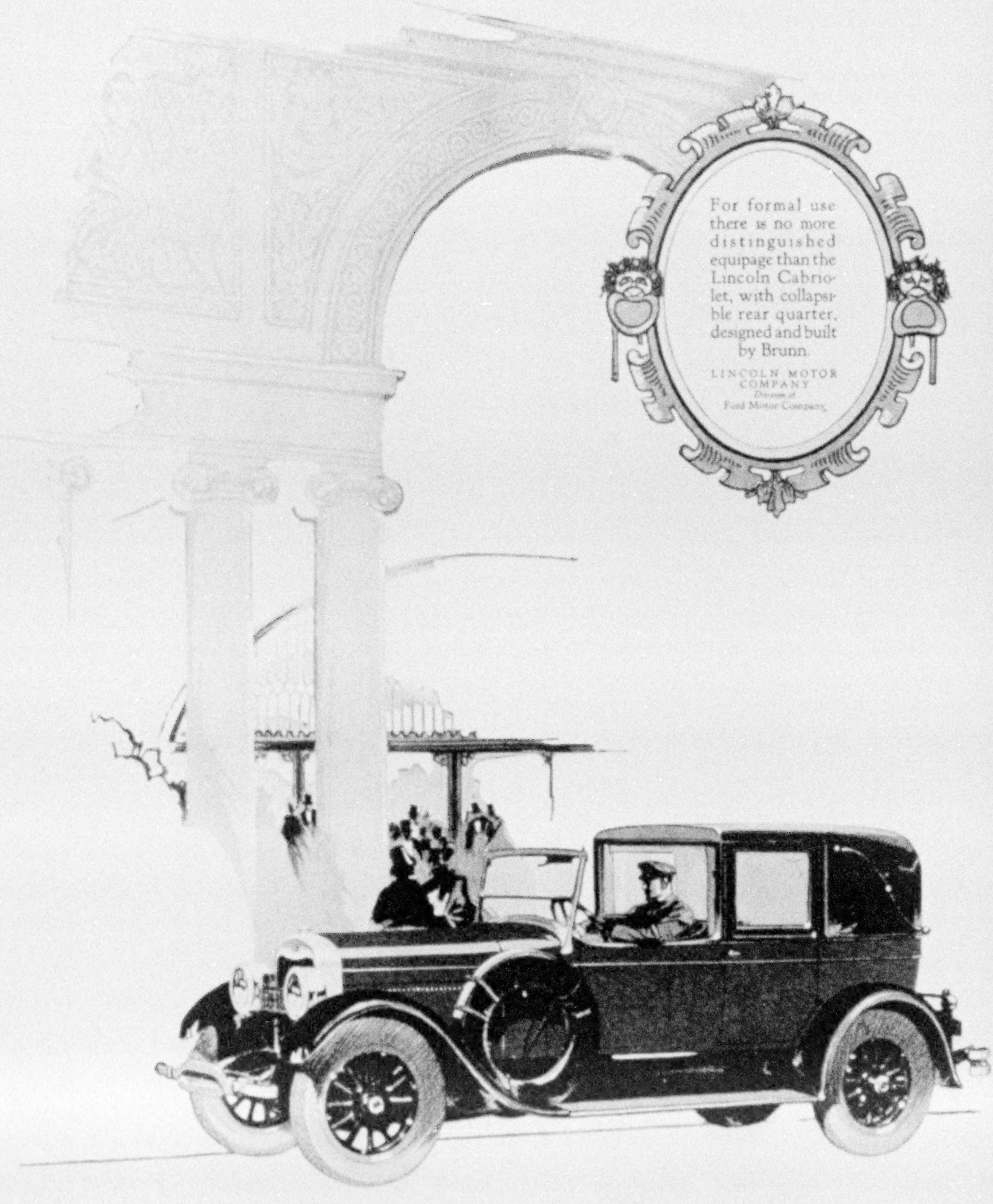

For formal use there is no more distinguished equipage than the Lincoln Cabriolet, with collapsible rear quarter, designed and built by Brunn.

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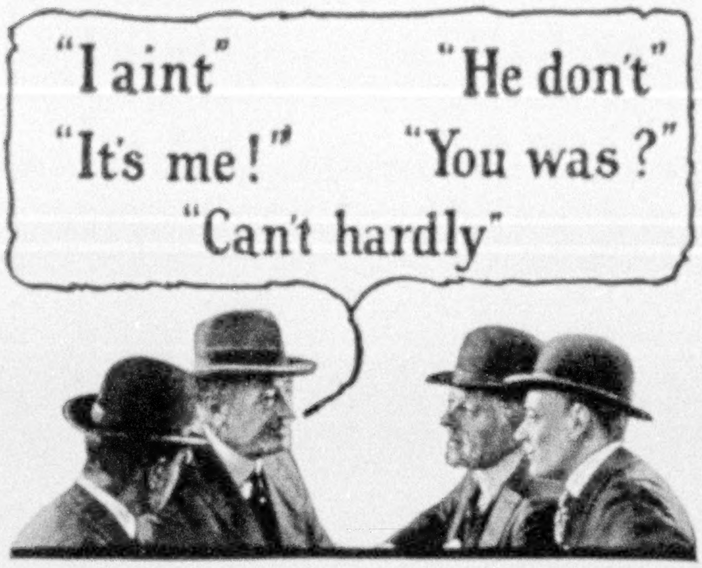

What Are YOUR Mistakes in English?

They may offend others as much as these offend you

IF some one you met for the first time made the mistakes in English shown above, what would you think of him? Would he inspire your respect? Would you be inclined to make a friend of him? Would you care to introduce him to others as a close friend of yours?

These errors are easy for you to see. Perhaps, however, you make other mistakes which offend other persons as much as these would offend you. How do you know that you do not mispronounce certain words? Are you always sure that the things you say and write are grammatically correct? To *you* they may seem correct, but others may know they are wrong.

Unfortunately, people will not correct you when you make mistakes; all they do is to make a mental reservation about you. "He is ignorant and uncultured," they think. So you really have no way of telling when your English offends others.

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Sherwin Cody, perhaps the foremost teacher of English in the country, has prepared a simple 15-minute English test which you can take in your own home. This test, with the answers which will also be sent, tells you at once just where you stand. You can discover at a glance whether you make even slight errors. Give yourself this test. If you are efficient in English, it will give you greater confidence; if you are deficient, you surely want to know it, so that you can correct your mistakes.

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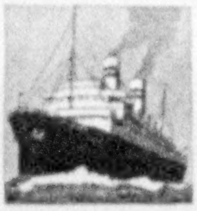
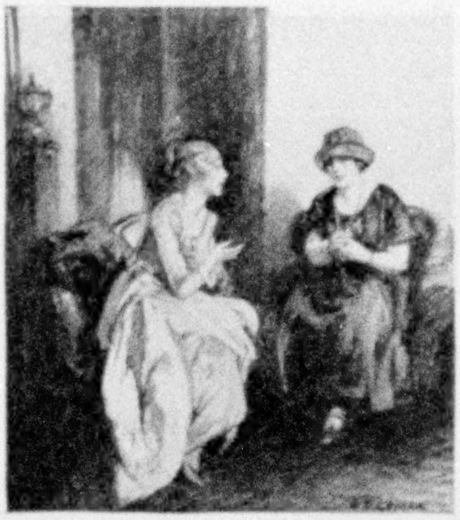


Locate the Cause!

"HOW do you feel?"—Too often your answer is, "Not very well. I am troubled with indigestion."

Your answer is given in perfect good faith, but are you certain it is correct? Physicians tell us that half their patients who believe they are suffering from indigestion have some serious organic disturbance.

The trouble may not be in the stomach at all. It may be in the intestinal tract, or the gall bladder, the kidneys, the liver, the pancreas, or the appendix. It may be in the nervous system or the heart. Or it may be that faulty habits of eating or emotional disturbances have brought about disordered bodily conditions which masquerade as indigestion.



The Beloved Quack

You know them—the men and women who say: "Just try this for your indigestion. It *always* helps me." Not content with "doctoring" themselves for a chronic complaint, they venture advice concerning the possibly serious ailments of others.

These attacks of pain, nausea or discomfort are Nature's warning to look for the real trouble. What folly to soothe a symptom and leave the cause untouched.

Indigestion may be the shadow of some real, hidden difficulty which should be located. Because it is not thoroughly understood, men and women sometimes treat it lightly—they are almost ashamed to admit having so slight an ailment. *So slight!*—It may be the early warning of a serious disease. *So slight!*—They take their favorite remedy or some "cure" passed along by a friend. *So slight!*—yet by merely dulling pain, not correcting the cause, they may be cutting many years from their lives.

If you suffer from pains after meals you may have an ulcer of the stomach. A violent, stabbing pain which recurs at intervals may mean gall-stones or a diseased appendix.

When you are in sound health you should be able to digest, without distress, nearly every kind of good food. It is only when something has gone wrong in your body that special diet is necessary.

Remember that the nutritive parts of steak, chops, vegetables and all other foods must be taken into your blood before they can be of service to you.

Eat regularly and never hurry your eating. Chew your food thoroughly so that both in your mouth and in your stomach the digestive fluids can act easily upon it. If you have only fifteen minutes' time, you will get far more real benefit from eating fifteen minutes' worth than from trying to crowd an hour's meal into the stomach in a quarter of an hour.

If you are subject to indigestion, see a doctor. It may be a temporary disturbance, easily corrected, or it may be serious organic disease. Find out!

Practicing physicians tell us that the majority of visits to their offices are made by persons suffering from so-called indigestion.

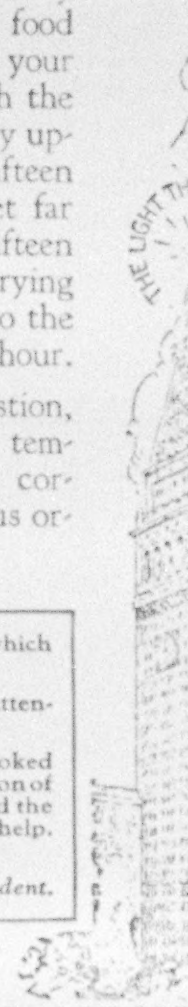
When we look at the mortality records and see that heart disease takes more lives than any other cause of death—that the death rate from appendicitis has not diminished in the past ten years—that cancer and gall bladder troubles are claiming thousands of victims every year—

—and when we think that many of the victims of these diseases neglected the early warnings which seemed to be indigestion—

—then we realize the necessity for paying attention to the message which Nature is sending.

One common cause of indigestion is badly cooked food. If to you are left the choice and preparation of nourishing, easily digested food, you will find the Metropolitan Cook Book a tremendous help. Send for a copy. It will be mailed free.

HALEY FISKE, *President.*


THE LIGHT THAT NEVER FAILS

Published by

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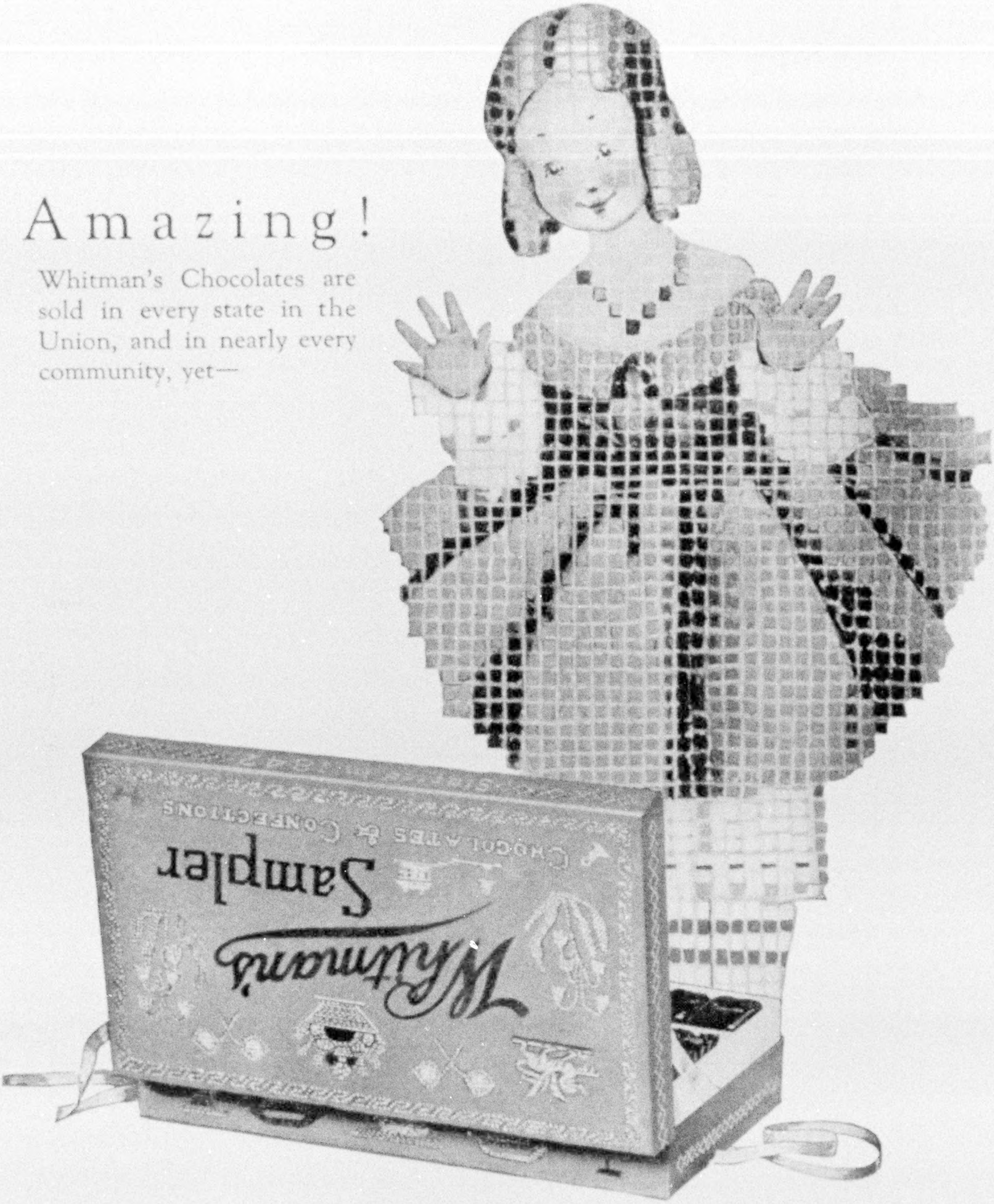
Whitman's Chocolates are sold in every state in the Union, and in nearly every community, yet—



—WHEREVER a package of Whitman's Chocolates is opened there is a double wonder of quality and freshness. Whitman's are distributed *direct* to each local store acting as our sales agency—not through a jobber. Every package is doubly guaranteed to give complete satisfaction.

STEPHEN F. WHITMAN & SON, INC., PHILADELPHIA New York Chicago San Francisco

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THE NATIONAL GEOGRAPHIC MAGAZINE

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ON THE TRAIL OF THE AIR MAIL

A Narrative of the Experiences of the Flying Couriers Who Relay the Mail Across America at a Speed of More than 2,000 Miles a Day

By Lieut. J. Parker Van Zandt, U. S. Army Air Service

Author of "Looking Down on Europe," in the National Geographic Magazine

"When I said I would die a bachelor," remarked Benedick, referring to his Beatrice, "I did not think I should live till I were married." Aircraft, many a good citizen will affirm, no doubt have their use in warfare; but, as for him and his affairs, they are a thing apart.

New facts in time, however, sweep away the most stubborn prejudices. There is a revolutionary fact abroad in the land: aircraft have gone to work. And the Nation is waking to find itself fast wedded to a new handmaid of progress—the United States Transcontinental Air Mail Service.

FRONTIER SPIRIT LIVES AGAIN IN THE AIR MAIL

The story of this great overhead, skyline trail linking East and West, along which, through storm or calm, in darkness or in light, a score of winged couriers relay the public mails across three thousand miles of continent in less than a day and a half, is a modern romance of transportation as fascinating as any that comes to us out of the colorful past.

It is the undying spirit of the Old Frontier aflame again, that restless torch once borne by Daniel Boone and Bonneville, the heritage from two hundred years' invasion of an untamed borderland. It is the spirit that urged the lagging caravans along the old Oregon Trail and spurred on the gallant riders of the Pony Express. It is the quickened temper born out of the Winning of the West, that smolders in the blood of every true American,—that is the most American thing in all America.

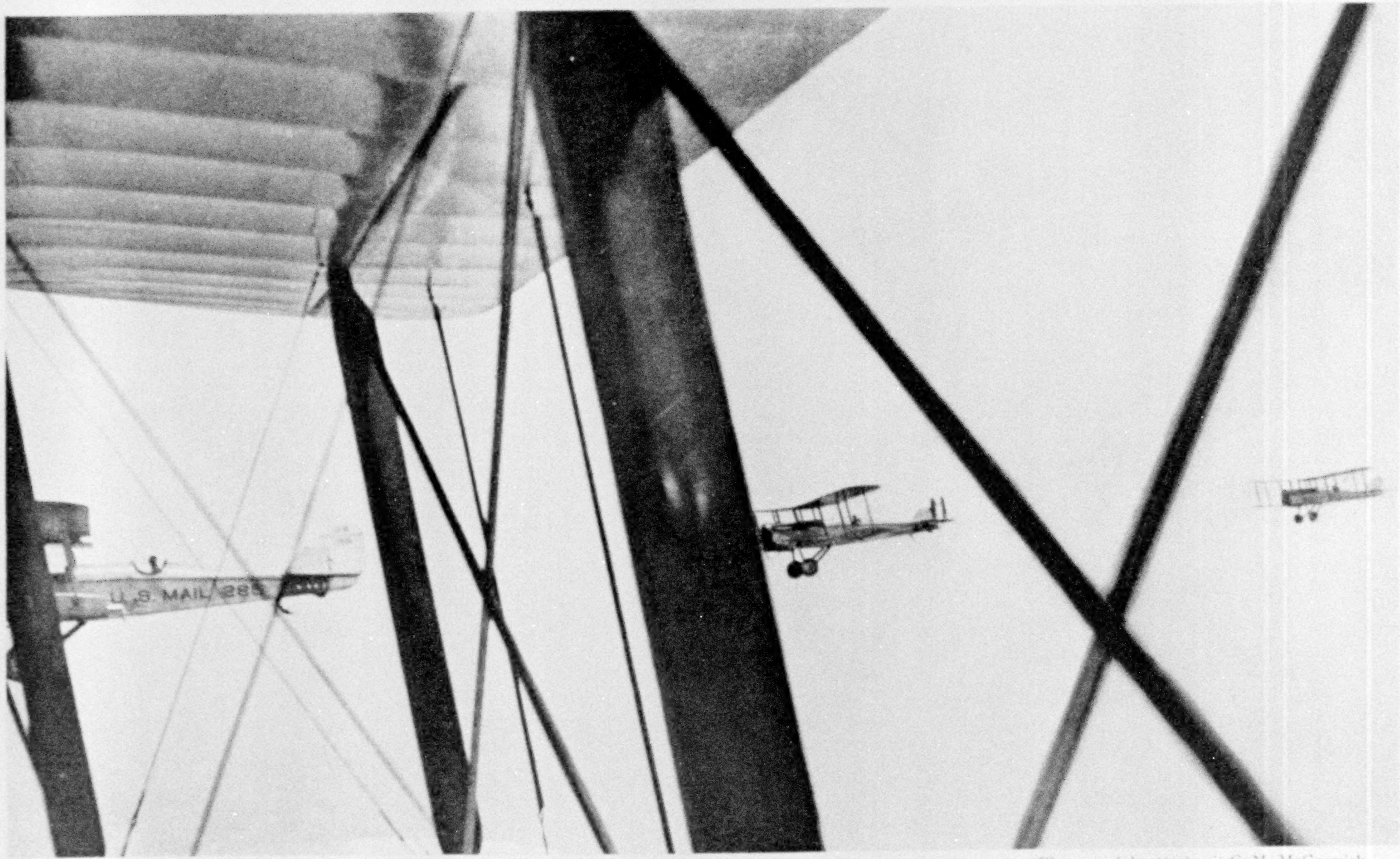
But picture it for yourself. A bitterly cold December night on the great upland prairies of Wyoming. The air is thick with swirling snow driven by a winter gale that sweeps down out of the hills, hidden far behind the somber curtain of the night.

From the lighthouse tower at the Cheyenne Air Mail Field, the great rotating beacon light ceaselessly flings its multimillion candlepower beam against the encroaching horizon, piercing the snow-filled air for a little way, glinting an instant on the ice-laden telephone wires leading into town, and fleeting across the temporary lean-to shelters for the planes, where a disastrous fire had gutted the hangars a few weeks before. Midnight and minus 36 degrees.

Official Photograph, U. S. Army Air Service

A NEW AIR VIEW OF LADY LIBERTY AND THE NEW YORK SKYLINE

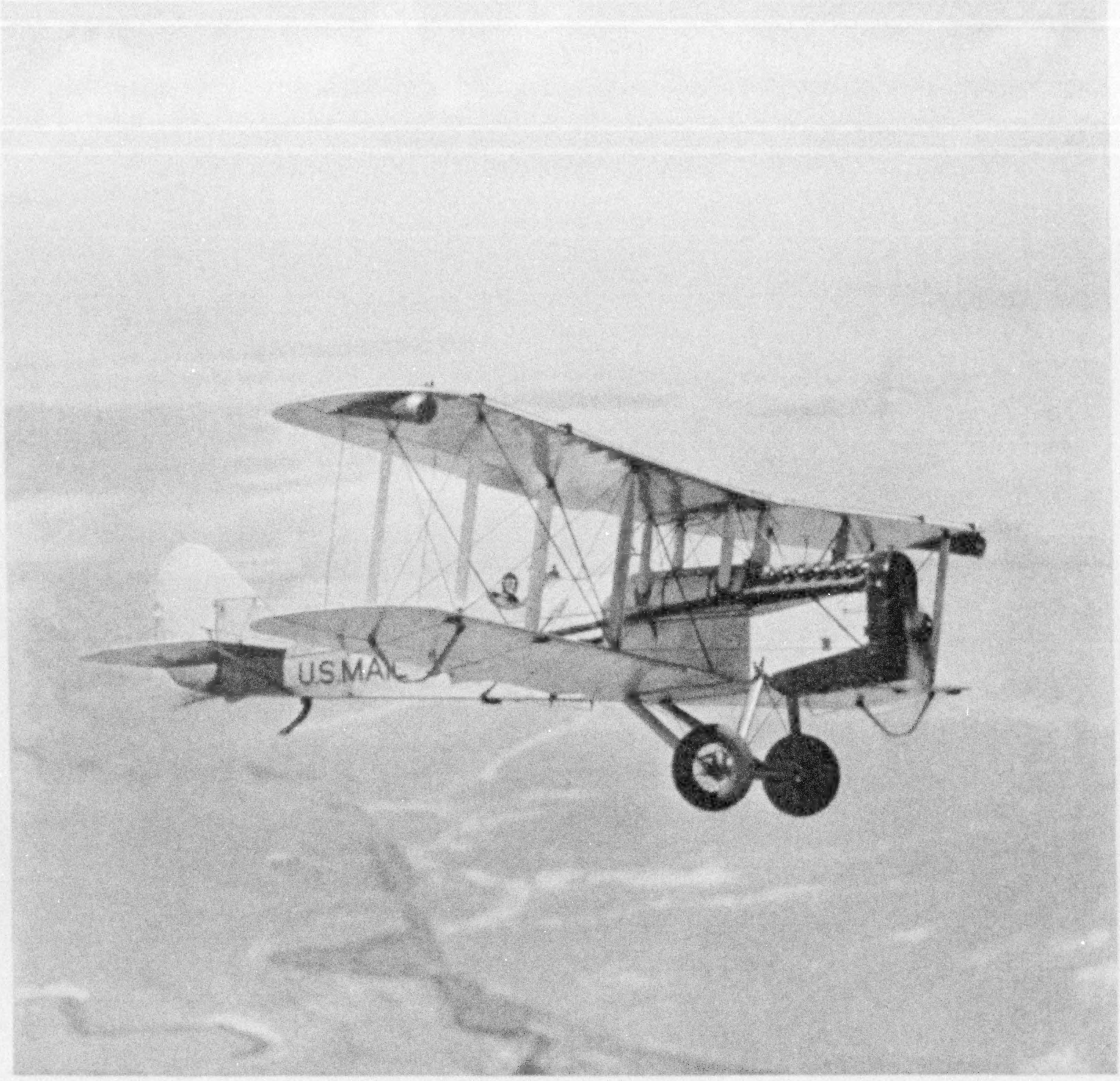
There are three zones for the transcontinental route, and the postage rate for each zone is 8 cents per ounce. The zones are: New York to Chicago, Chicago to Cheyenne, and Cheyenne to San Francisco.



Photograph by Mechanic C. M. McCormick

A PHOTOGRAPHIC PLANE ESCORTING THE AIR MAIL

The westbound New York-San Francisco schedule (2,665 miles) is 34 hours, 20 minutes; eastbound, 29 hours, 15 minutes. The prevailing winds are from the west, thus aiding the pilot in his eastward flight. This time includes stops at 15 stations for gas and oil and exchange of mails.



Official Photograph, U. S. Army Air Service

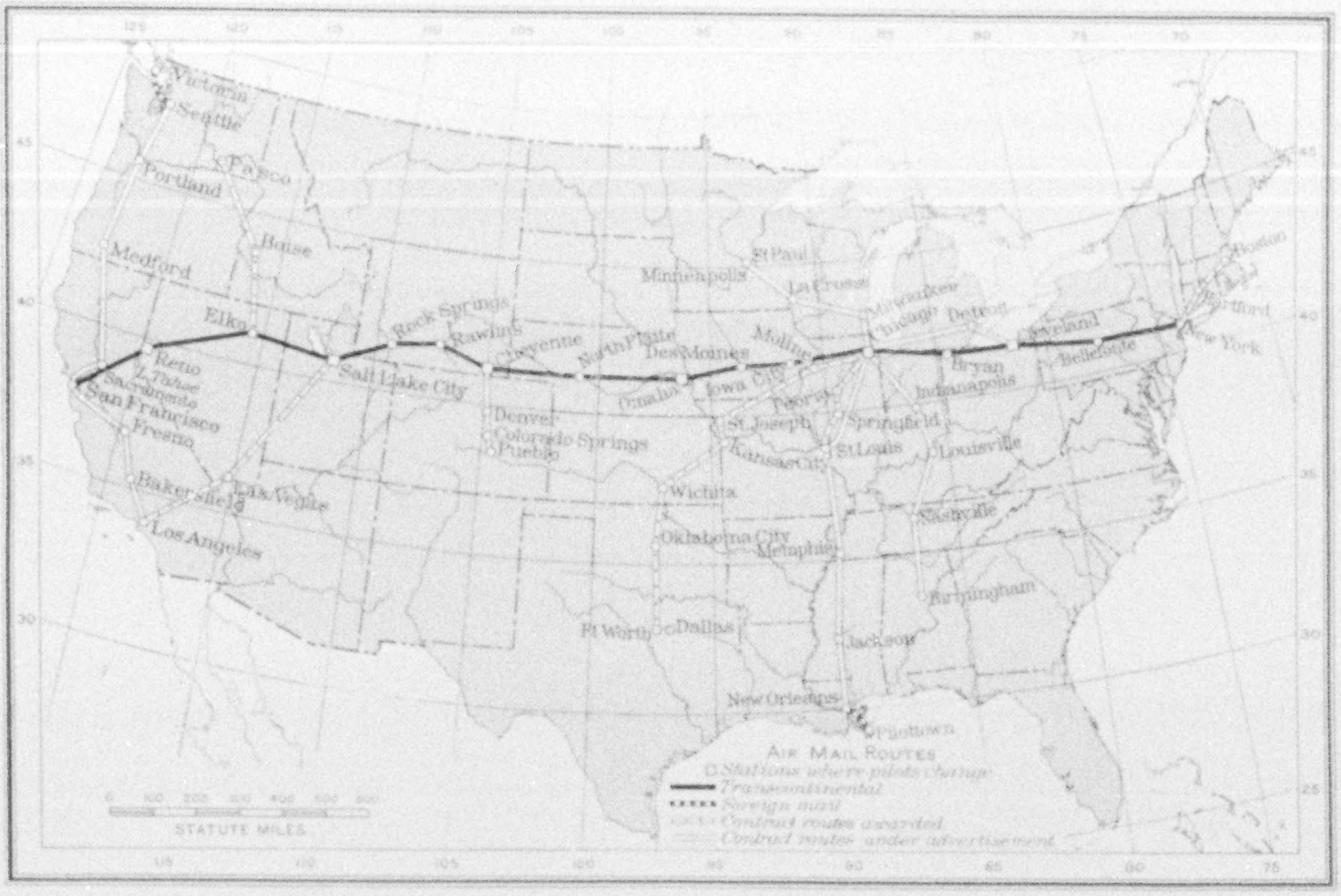
"COURIER OF NEWS AND KNOWLEDGE"

The Post Office Department contemplates ultimately getting out of the air transportation business and having all air mail carried by private companies, under contract, just as it now contracts with railroads for the carriage of railway mail. As a move in this direction and under authority granted by an act of Congress, February 2, 1925, it has called for bids on several new lines, most of them feeders to the main transcontinental route. A large number of bids were received, many of them from well-organized and financed companies. Government officials anticipate that during the next few years there will be a rapid expansion of air mail routes operated throughout the country by private corporations under contract with the Post Office Department.

Allison, with a special Christmas section of mail that morning out of New York, is due in. The radio operator at North Platte, 215 miles to the east, had reported him out at 9:50 p. m., adding laconically: "Visibility 200 yards, snowing, wind 40 miles an hour, from the north."

The telephone in the little shack serving as temporary office rang noisily, and a sleepy mechanic warming his chilled hands by the barracks stove responded. The caretaker at the Pinebluff emergency field, 45 miles east on Lodgepole Creek, was speaking: "Westbound plane passed overhead at 12:10 a. m. Snow too thick to see pilot signal with his landing lights, but from the sound of the motor he must be flying with his wheels almost on the U. P. tracks."

"Get my ship warmed up," ordered Collison gruffly, relinquishing his vantage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New York
Hartford
Boston
Air Mail Routes
○ Stations where pilots change
Transcontinental
Foreign mail
Contract routes awarded
Contract routes under advertisement
STATUTE MILES
0 100 200 300 400 500 600

Drawn by A. H. Bumstead

A MAP OF THE UNITED STATES AIR MAIL ROUTES IN OPERATION AND PROPOSED

The transcontinental Government-operated Air Mail route between New York and San Francisco forms the backbone of "a skeleton in the making" of commercial Air Mail routes. Five commercial contract Air Mail routes have already been awarded to contractors, other routes are under advertisement, and additional routes are under consideration by the Post Office Department. During the fiscal year 1925 the Air Mail expended $1.097 for every mile flown, and flew 2,501,555 miles. The cost for transportation only (that is, pilots' salaries and gas and oil) was 20.9 cents per mile. The rest was the cost of building, maintaining and overhauling the planes, engines, and other equipment; the operation of the 18 terminal fields, 89 emergency fields, and approximately 500 beacon lights along the 2,665-mile airway, radio operators' salaries, watchmen, etc.

point by the stove and moving over to the corner where his parachute and winter flying clothes lay piled. "Allison'll be here in a few minutes."

Collison's run was from Cheyenne to Salt Lake, 400 miles, over the mountain ranges and desert plains that form the Continental Divide.

RUSHING THROUGH A BLIZZARD WITH CHRISTMAS MAILS

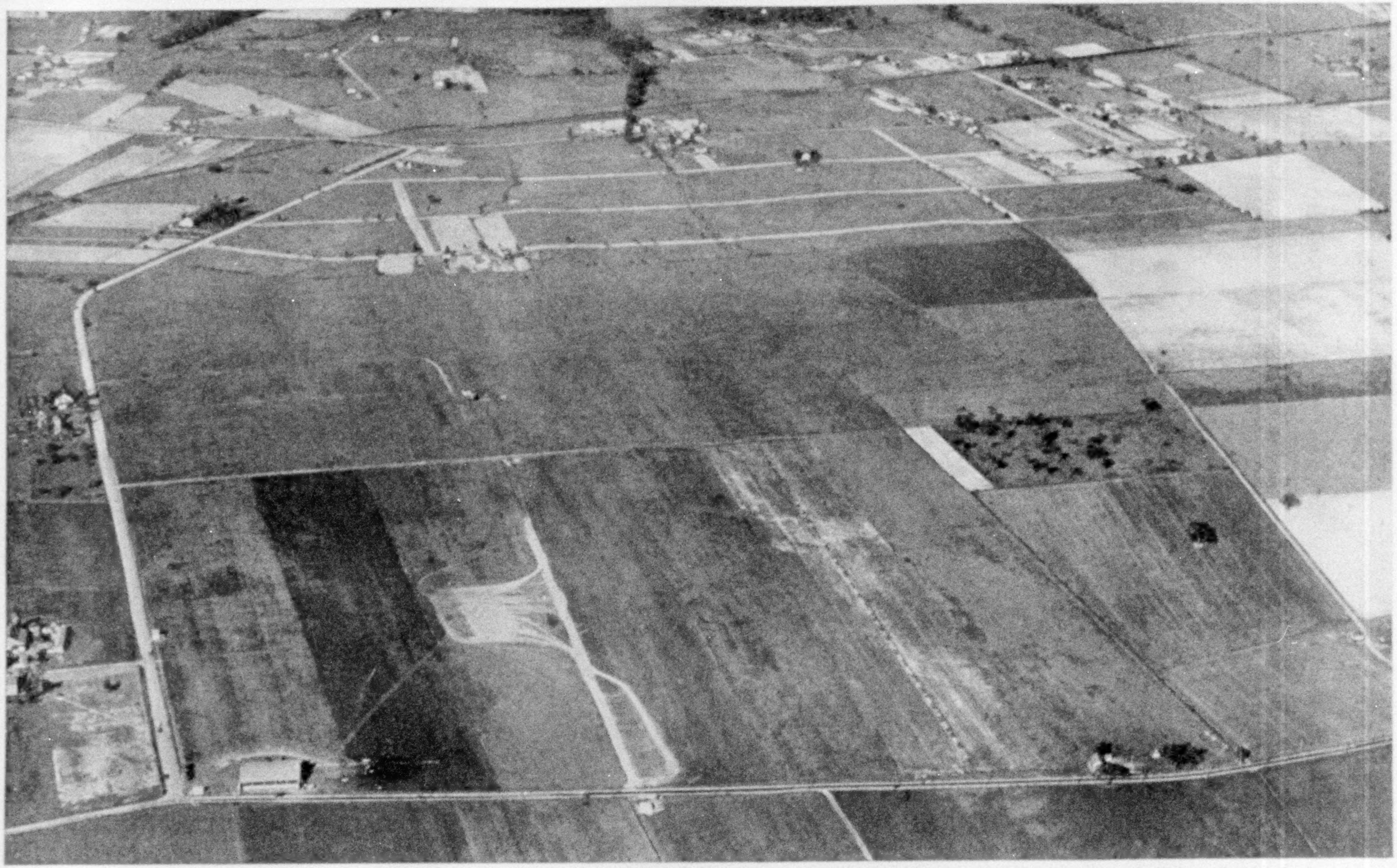
The Superintendent of the Mountain Division looked worried. Rising from his desk, he threw open the office door. Out of the black night an icy blast of snow-laden air rushed into the room, to beat and sizzle against the glowing iron of the stove. A sudden eddy of wind flung itself on the piled snowdrifts about the doorway, catching up the dry flakes and whirling them away in a smother of darkness.

Under the sweeping pencil of light, the faint outline of the near-by shelters flashed suddenly into brilliant relief, then sank back into the storm. The long, mute row of border lights that marked the boundary of the field lay hidden behind the drifting blanket of snow.

And somewhere, thirty miles beyond, Allison was rushing headlong through the night, at a hundred miles an hour, above the Union Pacific tracks.

The Executive slammed the door against the gale. The mail must go, but—"Better wait, Collie," he advised grimly. "This is no flying weather."

"Wait! Heaven won't have it! We can't hold up the Christmas mails. If I can snake across the Laramie Hills,



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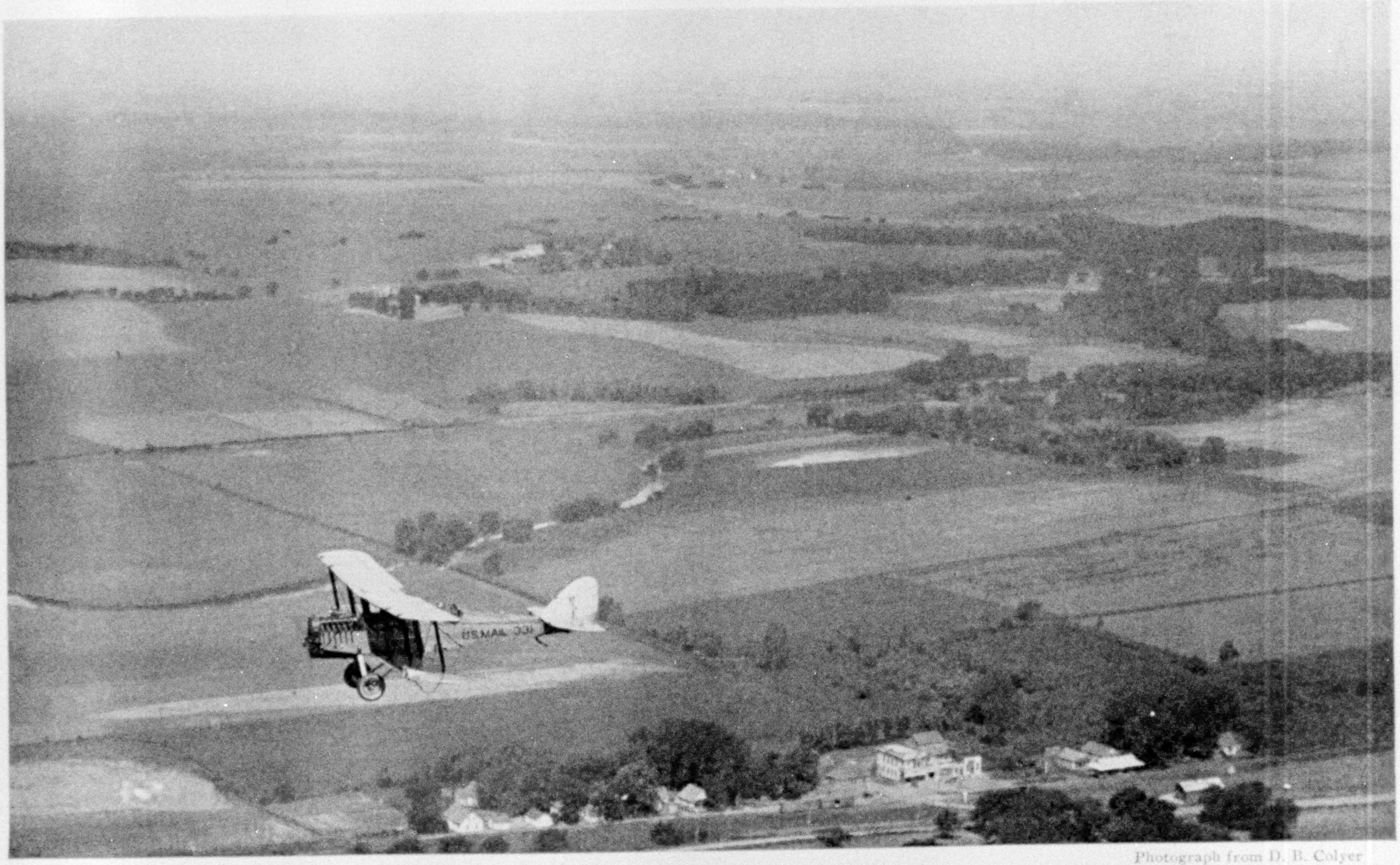
THE NEW EASTERN TERMINAL OF THE AIR MAIL—HADLEY FIELD, NEW BRUNSWICK, NEW JERSEY

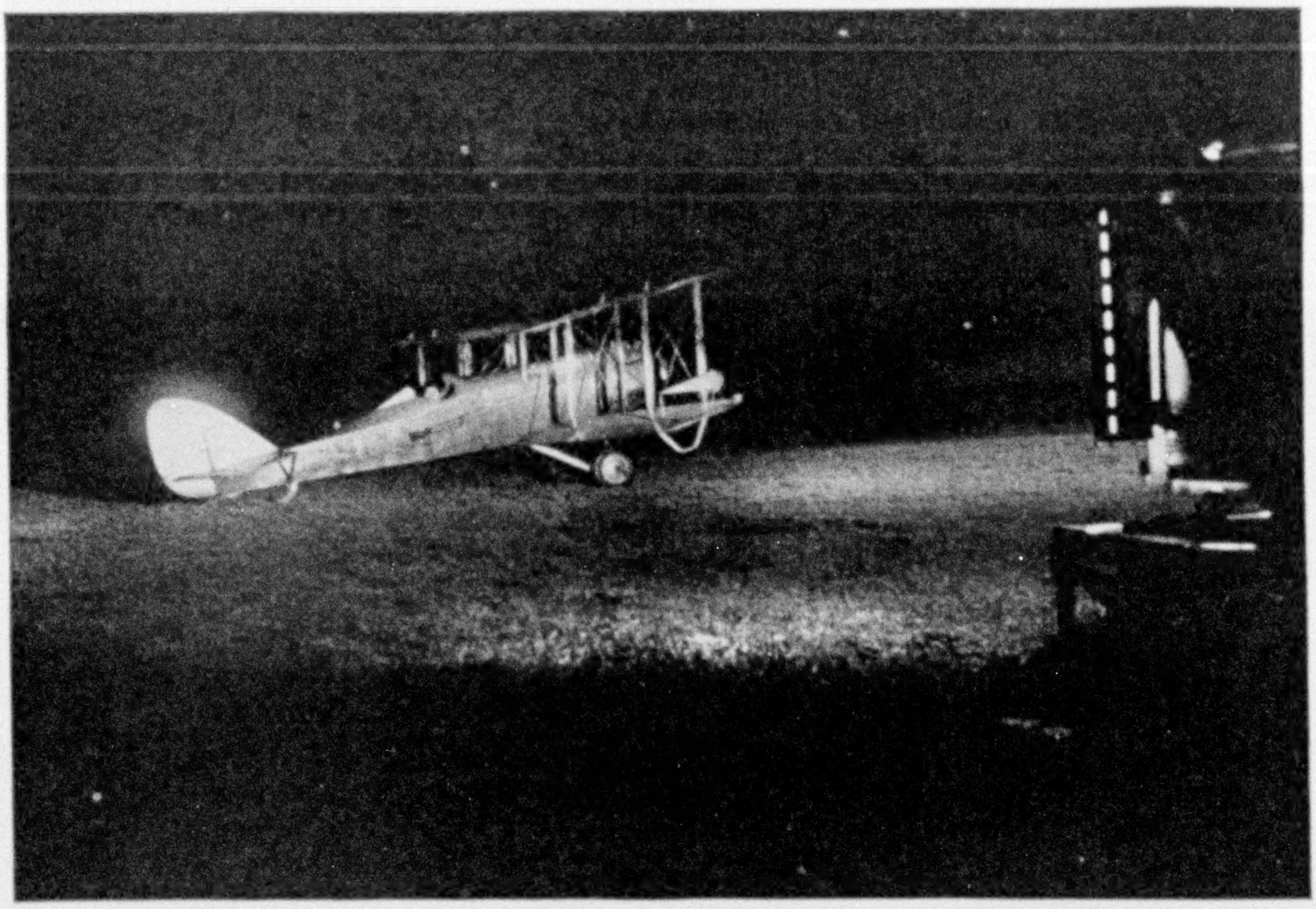
By transferring the terminal from Roosevelt Field, Long Island, to the western side of the New York Bay region, the air route to Chicago was shortened by 40 miles and the added hazard of flying over New York, Brooklyn, and the bay was avoided. The time required to reach the downtown post office by train, about 45 minutes, is no greater than it was before.



Photograph from D. B. Colyer

AMERICA AS THE MAIL PILOT ADMIRES IT

"Below us the dappled earth, alternate black and green, spread out like a vast inverted bowl, a spacious lawn 'full of sunlit dancing spaces'" (see text, page 25).



Photograph Courtesy U. S. Post Office Department

A NIGHT AIR MAIL PLANE ILLUMINATED BY A HALF-BILLION-CANDLEPOWER FLOODLIGHT AT HADLEY FIELD, NEW JERSEY

A special lens is used to keep the lights perfectly level and to prevent stray light from troubling the pilot while he is landing.

we're all right. Medicine Bow reports a 500-foot ceiling and Rock Springs is clear."

The Superintendent did not reply. Sherman Hill beacon light, on the Laramie Range, 30 miles west, is 8,600 feet high, and in such a storm it seemed folly to attempt it. There was still time to consider the matter; the mail was not yet in.

STARTING AN ENGINE IN BELOW-ZERO WEATHER

Out in the meager shelter of the temporary hangar, exposed to the gale and the snow, the mechanics were starting Collison's plane.

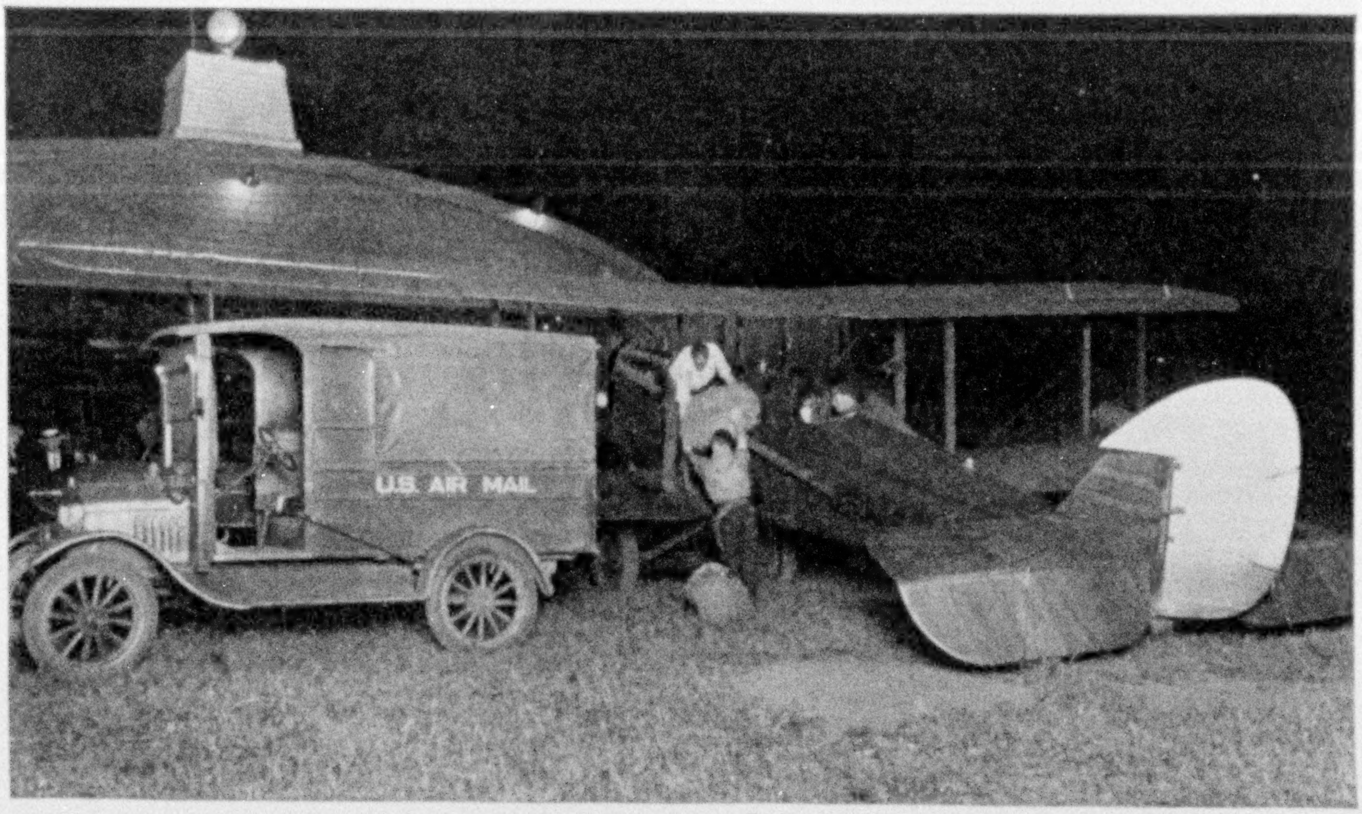
It is no idle matter to start an airplane engine in the open in minus-thirty-degree weather, in the midst of flying snow. Sixteen gallons of boiling water are poured into the radiator, twelve gallons of heated oil in the tanks. "Contact!" shouts the mechanic at the throttle, and three mechanics link hands, lurching forward together to pull the propeller through compression (see page 22).

The footing is treacherous on the icy ground, and should one slip and fall into the whirling disk his life would probably be forfeited. If the engine fails to start after the first few trials, the water and oil must be quickly drained before freezing, reheated, and the whole weary process repeated.

Two mechanics froze their faces that night, sticking to their unspectacular, but none the less heroic, task to "keep the mail in the air." And all through one bitter winter, after their fire, the Cheyenne force carried on day and night, out on the shelterless plain, defying tempest and storm.

Above the angry voice of the gale came a sudden shout from the watcher on the tower—"The Mail!" The mechanics on the line took up the cry, "The Mail!" Allison coming through!

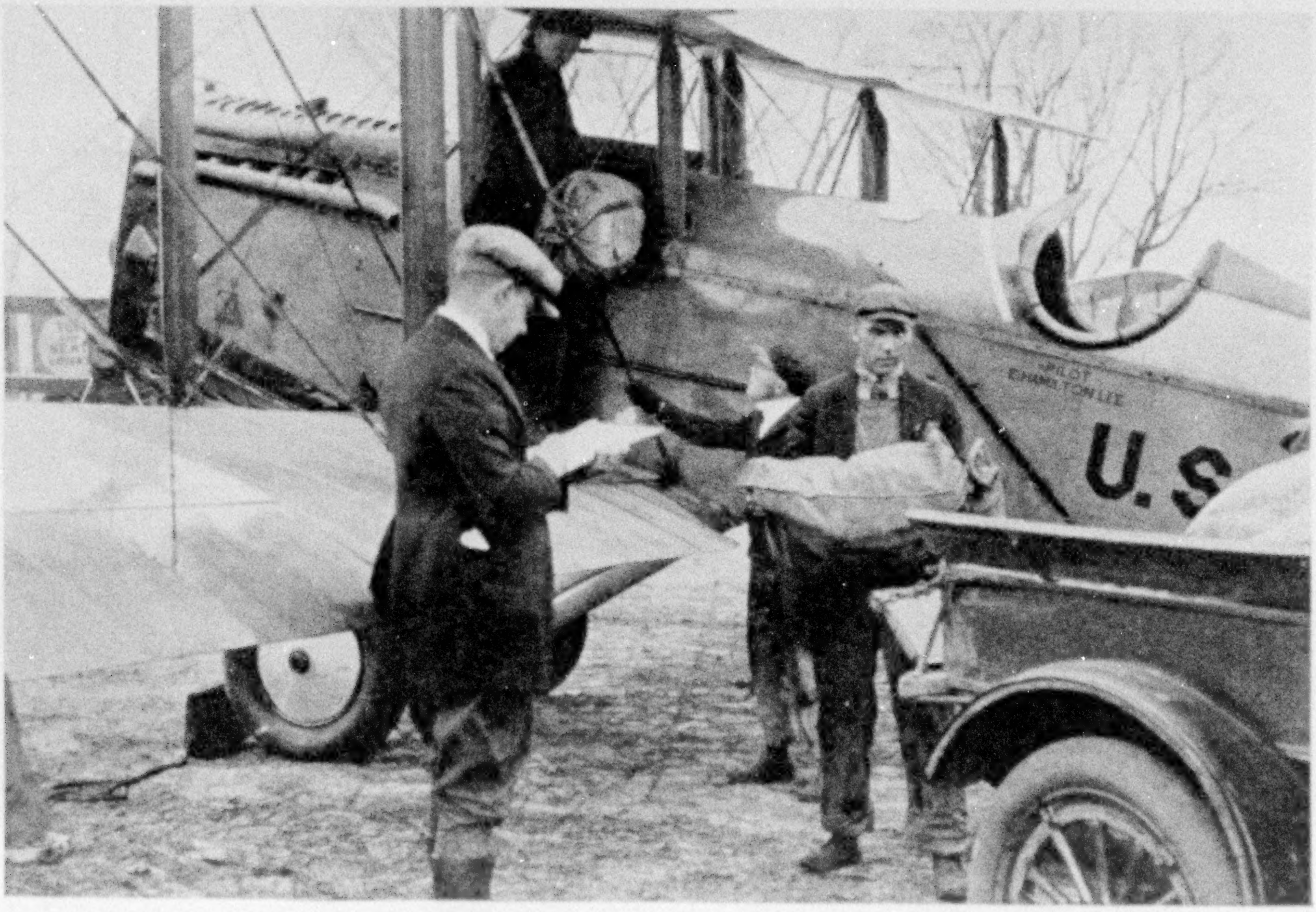
The beacon ceased its restless searching and shone down on the field, gleaming through the snow-choked air and throwing into bold relief, within its narrowed arc, the shifting snowdrifts, while



Photograph Courtesy U. S. Post Office Department

LOADING CHICAGO MAIL ON A NIGHT PLANE AT HADLEY FIELD, NEW JERSEY

The New York-Chicago overnight service, begun July 1, 1925, operates on a schedule of 9 hours, 15 minutes westbound and 8 hours, 30 minutes eastbound. Planes and pilots are changed at Cleveland. The postage rate is 10 cents per ounce, which is proportionately higher than the rate charged for the transcontinental service which leaves New York in the forenoon.

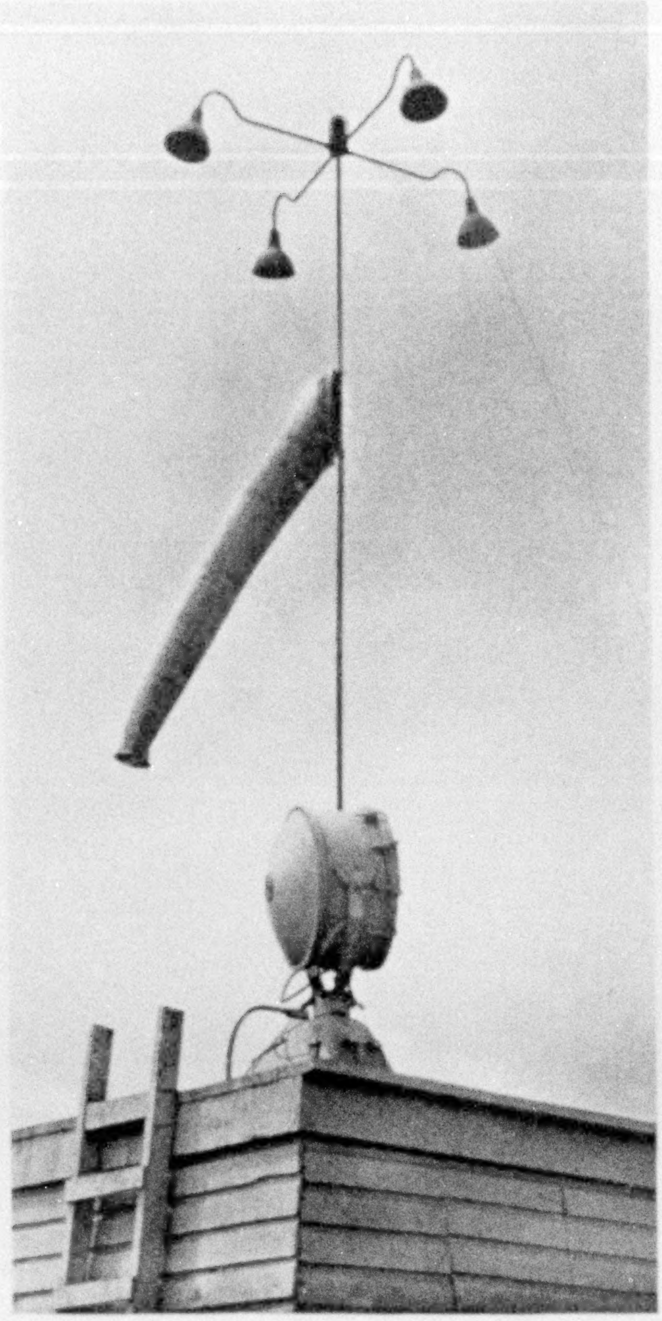


Photograph by Nat L. Dewell

CHECKING POUCHES AS THEY ARE TAKEN FROM THE TRANSCONTINENTAL MAIL PLANE'S FUSELAGE

The Post Office Department has 83 planes in flying condition and 13 now being reconditioned; 61 are equipped for night flying. Each pilot is assigned a plane for his exclusive use.

XUM



Photograph Courtesy U. S. Post Office Department

THE WIND CONE AND 24-INCH REVOLVING BEACON AT HADLEY FIELD, NEW JERSEY

Lights illuminate this wind-direction cone to aid in night landing.

the shrouds of night closed in, more impenetrable than before.

Behind that wall a steady, distant droning became audible, swelled to a roar, leaped suddenly to a crashing crescendo of sound, as Allison split the curtain of the night and flashed into view a bare hundred feet above the tiny oasis of light. An instant's view of the gleaming propeller disk, the flame-spewing exhaust, and he was across the light into the storm again.

But in that instant the pilot had marked the lighted wind cone on the hangar, standing out stiff before the gale, and knew which way he must approach the field to land.

"Heaven help us!" whispered a half-frozen "grease-monkey" through his chattering teeth. "He'll crack up, sure; he'll never get back to the field."

THE AIR MAIL DAILY ACCOMPLISHES THE IMPOSSIBLE

As Allison turned with the wind, the roar of his engine ebbed rapidly away, swelled again as, somewhere out in the darkness, he banked toward the field, and sank to a throttled rumble in the glide. Then silence, agonizing silence, save for the ceaseless whining of the storm and the creak and rattle of the shelter doors.

"Everybody out to locate Allie!" yelled the Superintendent, above the gale. "He must be somewhere on the field! And don't lose your direction away from the lights."

It was a quarter of an hour before he was found, hidden by the swirling snowflakes, near the far corner of the field—mail, pilot, and plane unhurt.

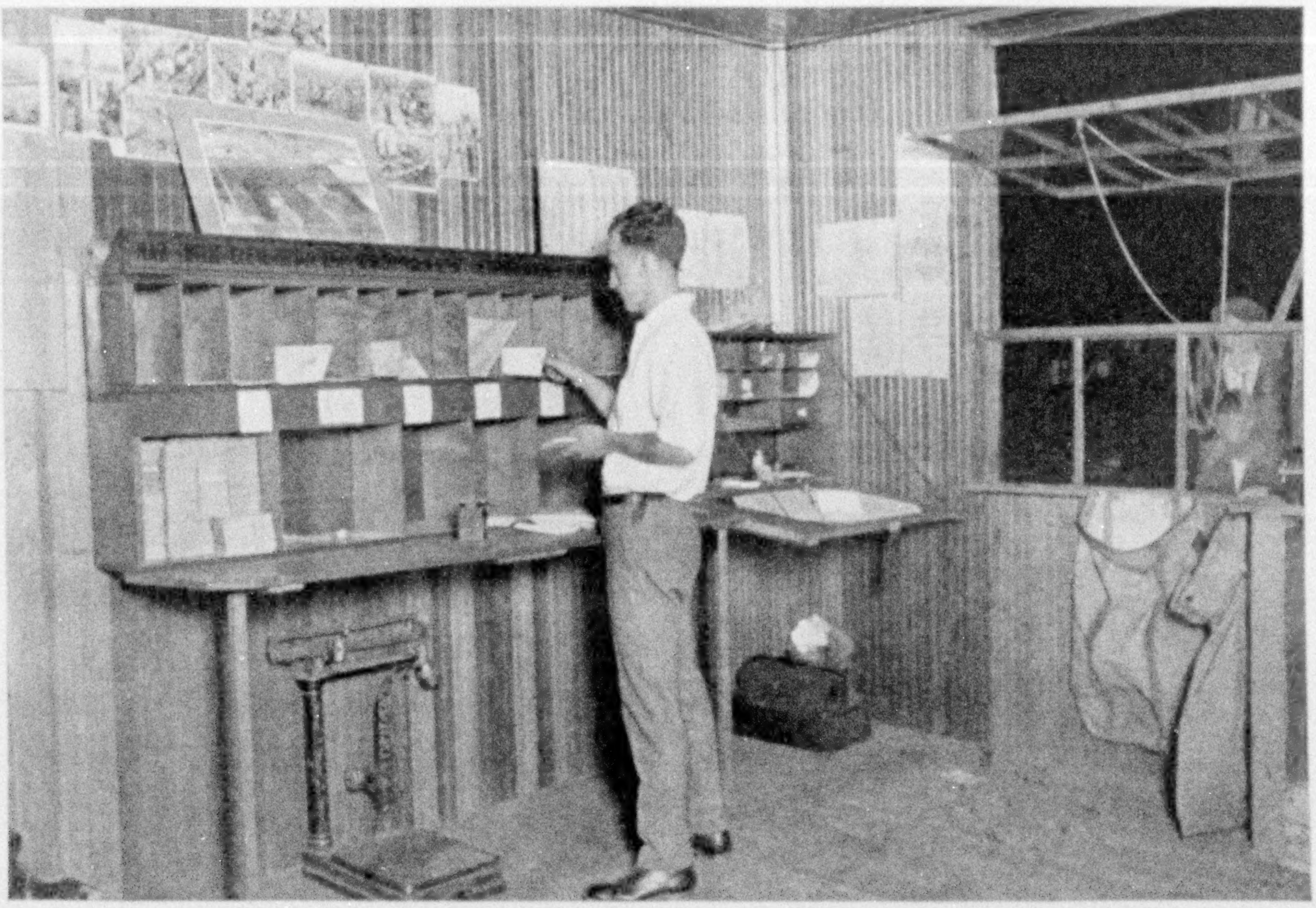
Impossible? Yes; but true. The Air Mail is daily translating improbable facts into truths.

"The flying visibility isn't as bad as you think," Allison was telling the protesting Superintendent, while sprawling in his big fur flying suit on the bench by the office stove and plucking gingerly at his half-frozen cheek.

"The snow is most all in the last fifty feet. This forty-mile breeze has been picking up dust off a hundred miles of snow-covered prairie, and it's traveling too fast to let go. That's why, on the ground, you can't see a hundred feet across the field. But 'upstairs' I could see down through it pretty well."

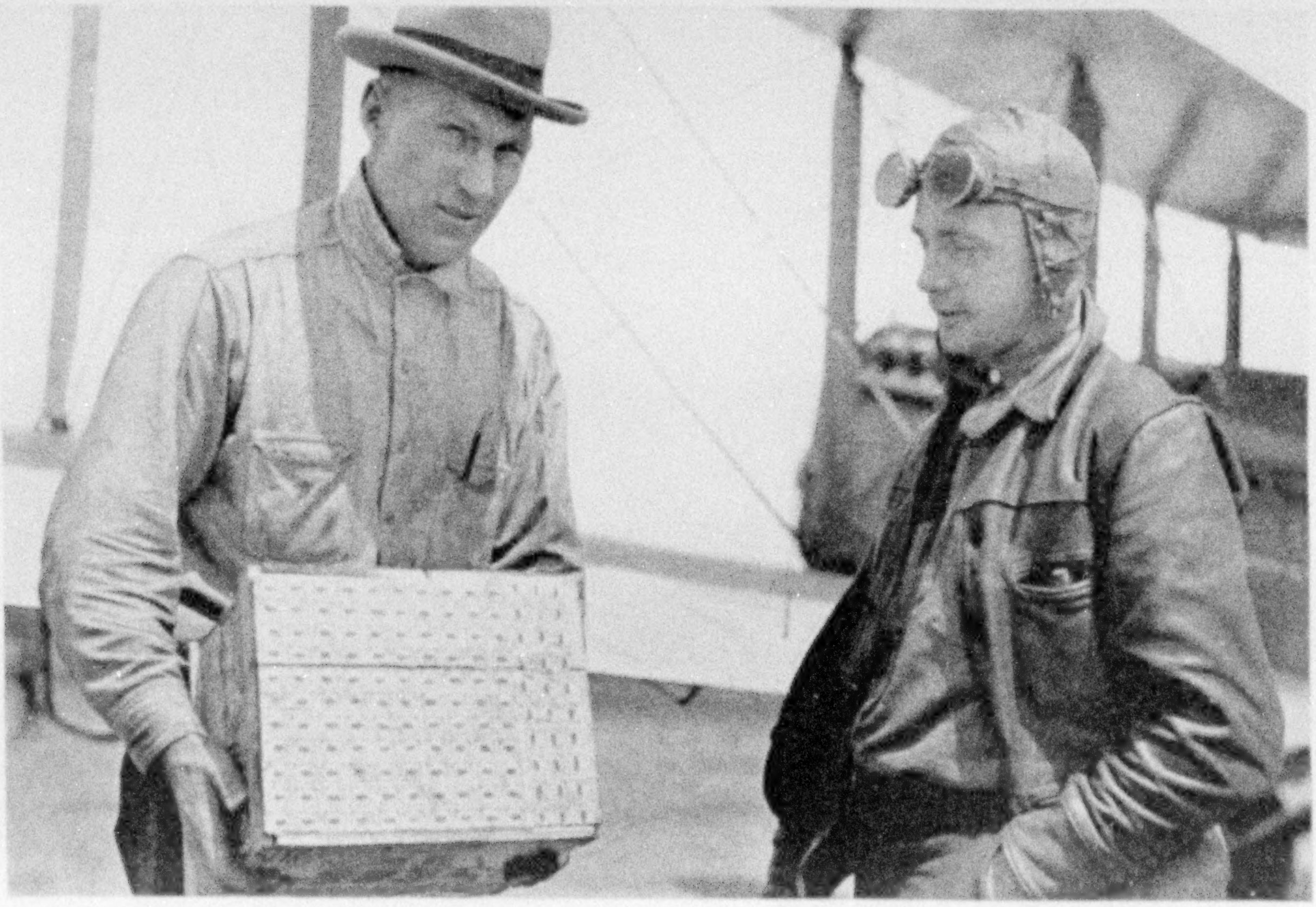
He leaned forward wearily to unbuckle his snow-encrusted parachute harness, while an admiring mechanic helped him remove his moccasin overshoes. "The real trouble in this country," he added plaintively, "is that there's too precious little to see.

"The towns in Nebraska and Wyoming must all roll up and go to bed at 9 o'clock. The South Platte is almost invisible—just a wobbly string of bare cottonwood trees. And the emergency field beacons look like pocket flashlights held behind red tissue



Photograph Courtesy U. S. Post Office Department

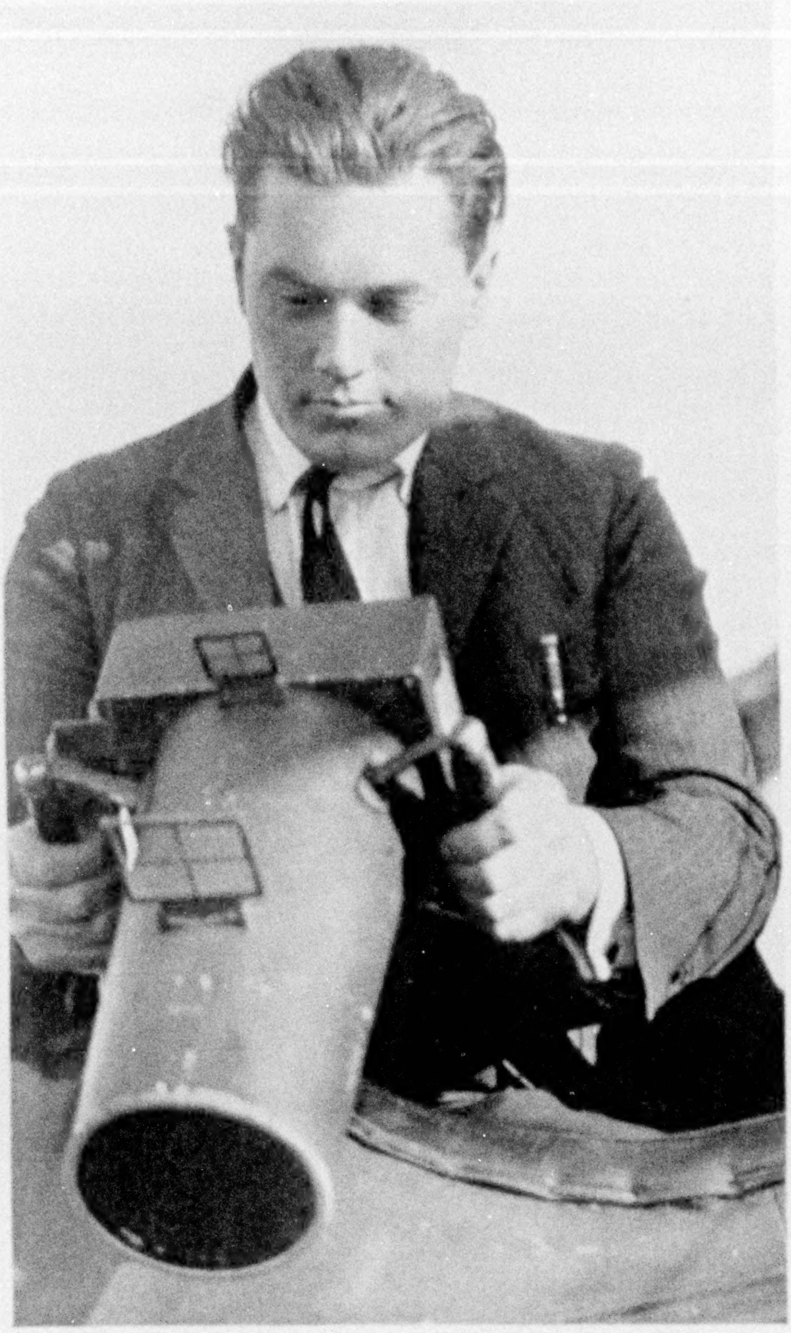
SORTING THE AIR MAIL AT HADLEY FIELD, NEW JERSEY



Photograph by Captain A. W. Stevens

A REGISTERED AIR-MAIL PARCEL

The variety of air-mail packages is surprising. News reels, motion-picture films, ladies' gowns, candy, and even golf sticks have been mailed by air between New York and San Francisco at a cost of 24 cents for each ounce.



Photograph Courtesy U. S. Post Office Department

A TYPE OF AËRIAL CAMERA

Many of the illustrations in this number of the NATIONAL GEOGRAPHIC MAGAZINE were made with apparatus of this type.

paper. Who was that newspaper humorist who called this 'the Great White Way'?"

Outside, above the dark field, the defiant searchlight had taken up its endless circling course again, flashing in each periodic passage against the frosted windowpane. At the door was the mail truck with the Denver pouches taken from the incoming plane, waiting to rush them to Cheyenne, whence they would be relayed southward by train.

"But, Allie," interposed the eager, wondering mechanic who had assisted him with the moccasins, "how in blazes could you see to get down through all this snow?"

Allison paused on his way to the door. "I didn't," he said simply. "Just squatted her down in the blizzard. First thing I knew, we were rolling over the drifts. 'Betsy' landed herself, I guess."

An impatient honk sounded from the mail truck and Allison moved stiffly forward. "You know," he flung over his shoulder, "since we started this night flying, I begin to understand why the birdies sing in the morning."

SEVEN PLANES HURDLE THE CONTINENT IN 32 HOURS

Collison took the mail through to Salt Lake that night. And Tuesday's mail out of New York was read Thursday morning in California.

Ames had brought that mail out of New York Tuesday, through the morning mist, five hours to Cleveland. Art Smith had hurried it over snow-mantled grain fields, three hours to Chicago. Page had raced with it toward the sinking sun beyond the Mississippi, reaching Omaha long after dark. Allison, alone in the night, above the snow-swept prairie, defied a winter's blizzard to bring it to Cheyenne.

Collison fought his way across the Continental Divide to drop down with it at Salt Lake in the early light of Wednesday. Marshall rushed it over alkali sinks and mountain ranges five hours, to Reno.

And Vance, in the final lap, swept it across the snowy Sierra Nevada to plunge down over the wide Sacramento Valley late Wednesday afternoon and slip in under the fog at San Francisco—thirty-two hours from New York Bay to the shores of the Golden Gate!

"BEEZOS" AND "GREASE-MONKEYS"

Day and night, seven pilots hurdle the continent at a rate of more than 2,000 miles a day; modest and brave collaborators in many an unsung Odyssey, written—if one had eyes to read—across the blackened faces of the canceled air-mail stamps.

Something of this great modern epic I already knew, from frequent flying visits to near-by Air Mail fields. Bit by bit, out of informal conversations with the "grease-monkeys" (as the mechanics are called) and with the "beezos" (as the mechanics have nicknamed the pilots), forgotten elements of the unusual story began to come to light.

You will not find them in the archives of the Post Office Department; nor in the prosaic records of the Air Mail files; nor are you apt to overhear them in the hangars. Beezos and grease-monkeys alike, after the manner of true men of action, make a common virtue of reticence.

Information must be "stewed out of them," as Mark Twain once said, "like the precious ottar of roses out of the otter."

So it was with keen delight that I welcomed orders from the War Department to take a plane and make an inspection flight along the entire transcontinental airway of the mail.

Photograph by Nat. L. Dewell

AN AIR-MAIL PILOT ENTERING HIS PLANE, WEARING A SEAT-TIGHT PARACHUTE PACK

The parachute, made of high-grade silk, is tightly folded in the pack. When the pilot wishes to use it, he jumps from the plane and, when clear, pulls a ring which opens the pack and allows the parachute to be caught in the wind.

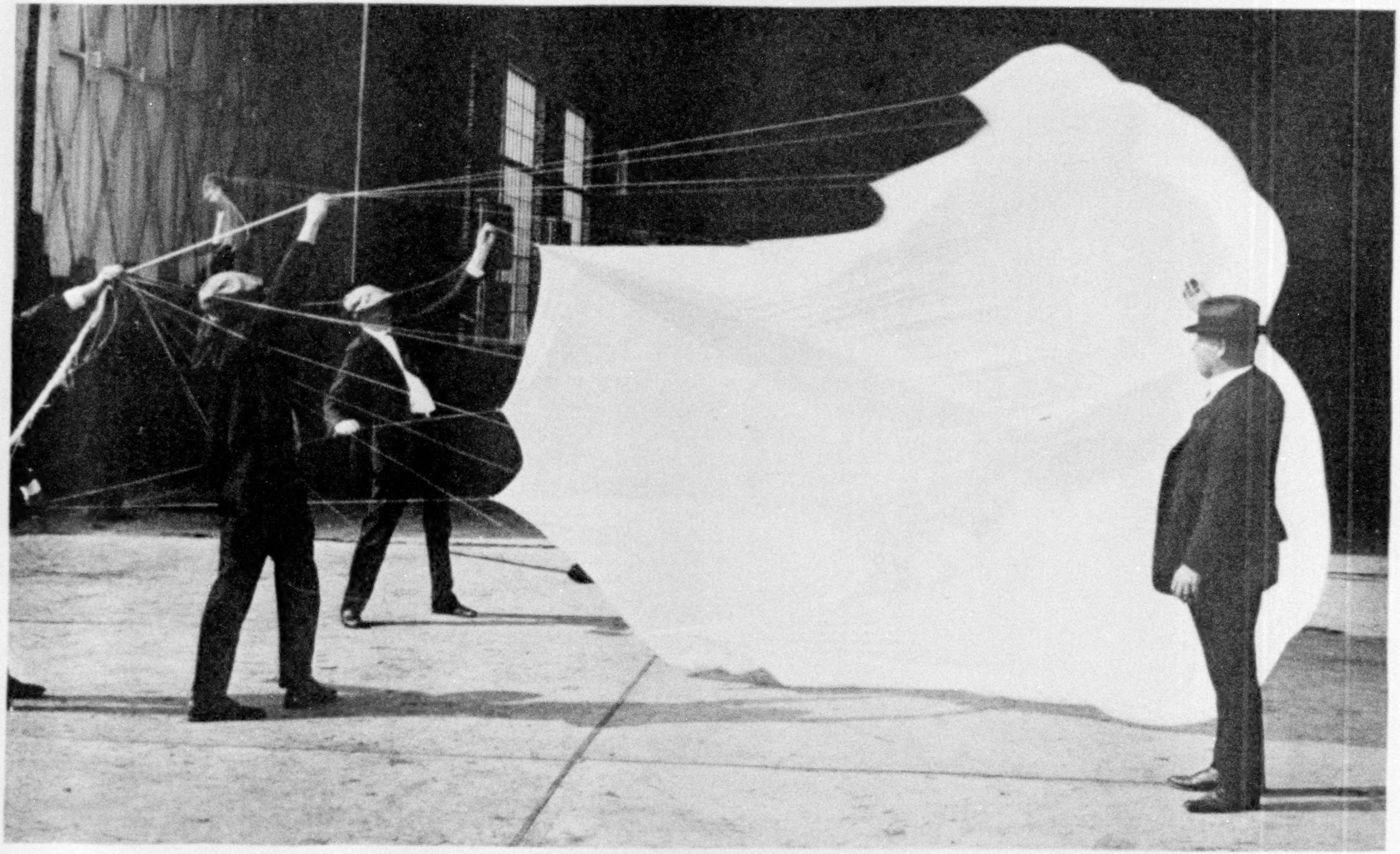
THE START OF A TRANSCONTINENTAL INSPECTION TRIP

Flying by easy stages from Washington to Monmouth, Illinois, where the Air Mail experimental shops are to be found, I hurried on after a brief visit and reached the field at Omaha late one afternoon.

The day had been rough and gusty, with banked clouds against the western sky; but, following a crimson sunset, a passing shower had cleared and cooled the air. "Evening red and morning gray help the traveler on his way"; and I accepted it as a hopeful omen for the 1,600-mile journey that still lay before me.

Far overhead the night hung glittering and resplendent, like an immense drapery, studded with tiny shafts of silver light. I climbed the steep ladder of the beacon tower to watch for the incoming plane from Chicago.

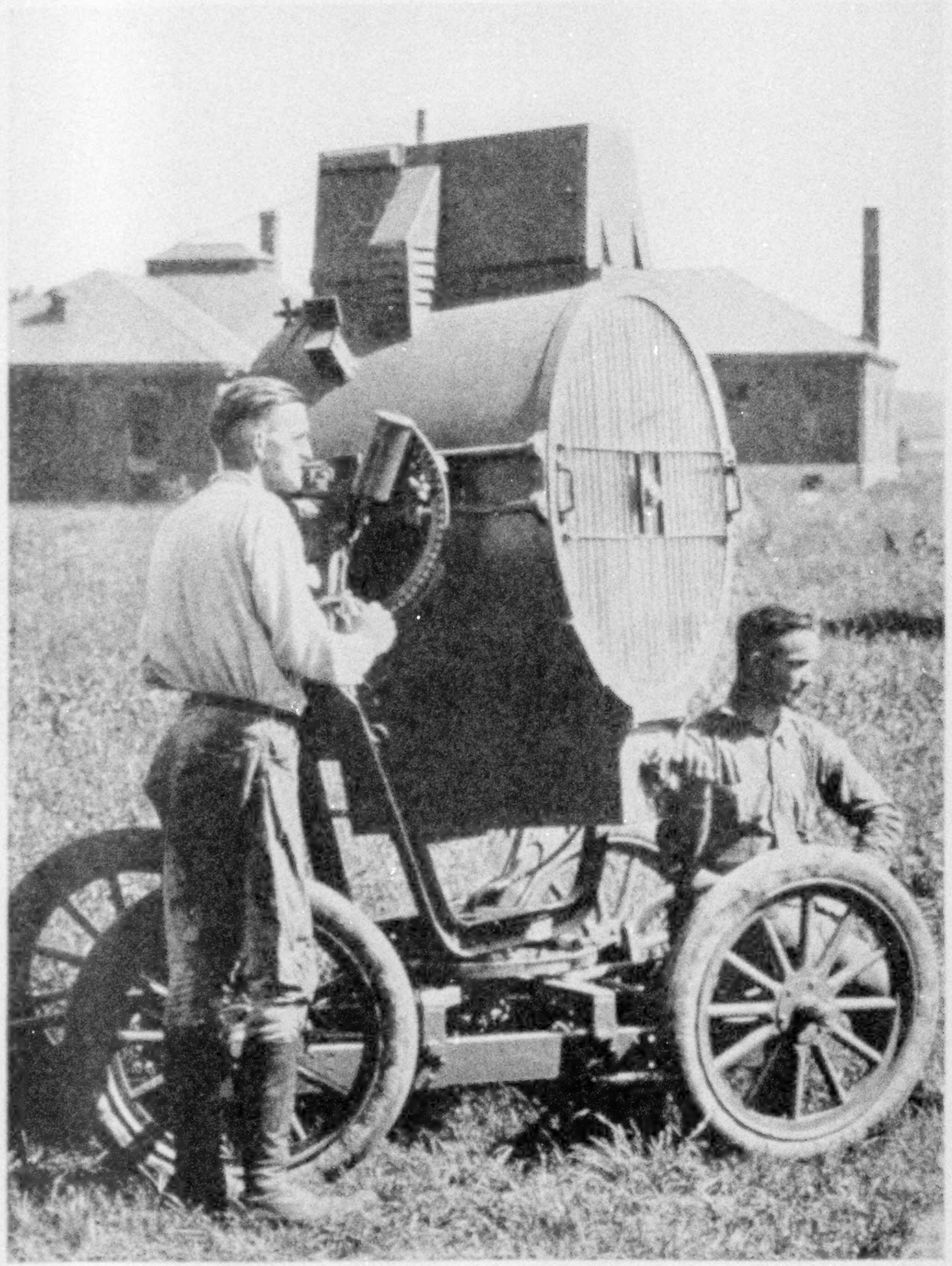
An idle breeze toyed fitfully with the limp cloth wind cone mounted on the floodlighted hangar roof just beneath me.

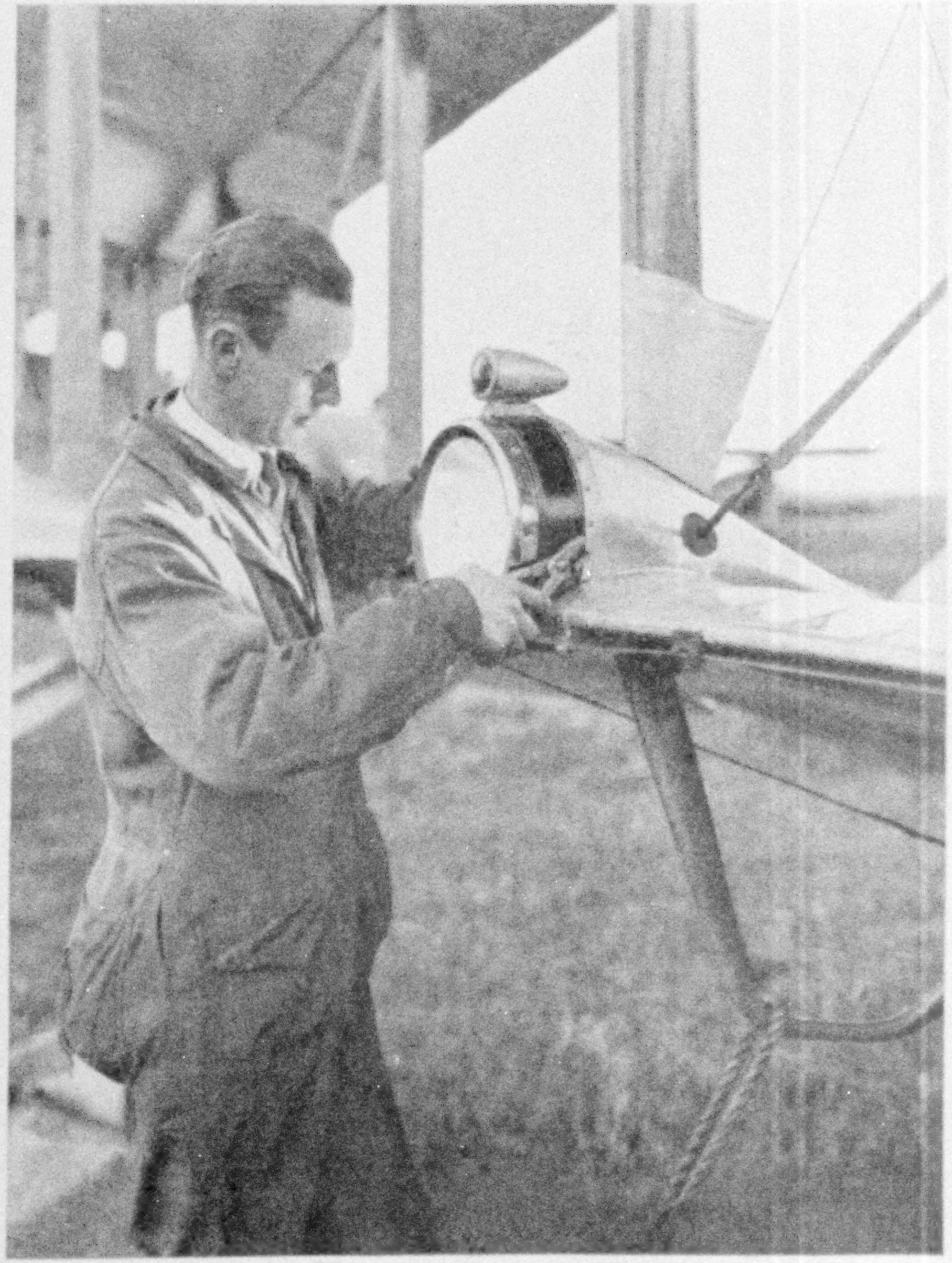


Photograph by Nat L. Dewell

THE TYPE OF PARACHUTE USED FOR FLARES

When the flare is released from its container under the fuselage (see illustrations, page 17), this parachute opens and permits the light to drift slowly to earth, illuminating a large area.





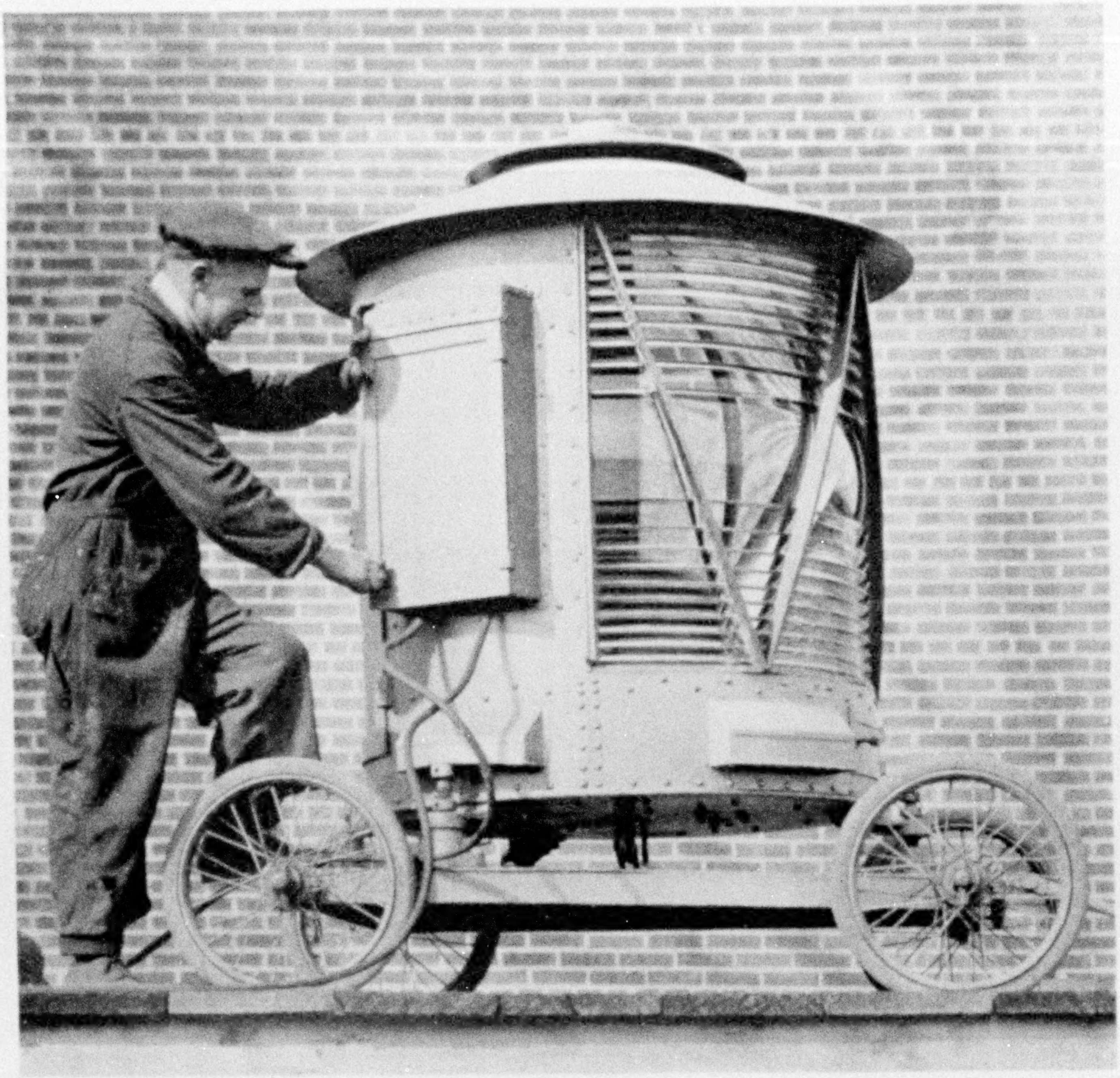
Photographs by Nat L. Dewell

ADJUSTING ONE OF THE 36-INCH ROTATING BEACONS

When set on 50-foot steel towers these lights rotate six times a minute at an angle of a degree or two above the horizon, and in clear weather can be seen 70 miles or more.

ADJUSTING LANDING LIGHTS ON THE WINGS OF A PLANE

These lamps have an intensity of 250,000 candlepower and are placed far out on the wing tips, so that no stray light will be caught by the whirling propeller blades and reflected back into the pilot's eyes.



Photograph by Nat L. Dewell

ONE OF THE POWERFUL FLOODLIGHTS AT AN AIR MAIL AVIATION FIELD, WITH A LIGHT INTENSITY OF 500,000,000 CANDLEPOWER

Through the open doors of the hangar a group of mechanics emerged, wheeling out a reserve plane onto the wide cement mat, their shouts and laughter floating upward.

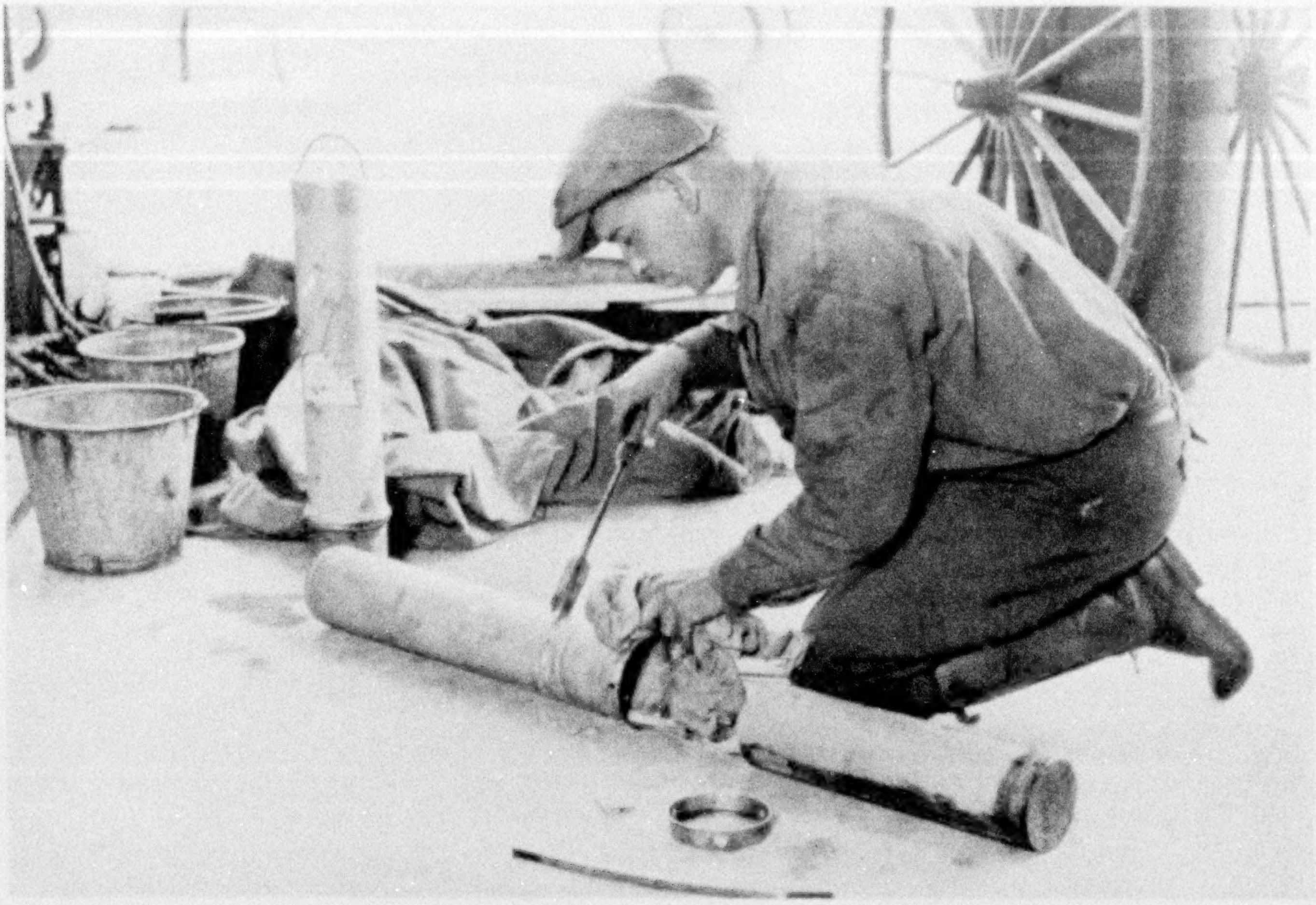
Beyond the friendly circle of the floodlights, the level, grassy surface of the landing field gleamed vaguely beneath its starlit blanket, blending into the night, its distant border sharply outlined by a long, low row of boundary lights.

Above my head the ponderous arc-light mechanism ground round and round in its unhurried course. The penetrating beam, like a thin saber of fire, flashed far out across the neighboring fields, gilding the high windows of Fort Crook barracks and the farmhouses on Bellevue Hill; while close behind hurried the cringing shadows.

A mile to the east, under a thin rising mist, lay the broad Missouri, whose muddy waters, "too thin for a beverage, too thick for a drink," find their source in the far-away Rockies. From a grassy meadow out in the dark river bottom a tiny automatic beacon winked cheerfully, like a lost gleam at the bottom of a well, marking the air trail that leads eastward more than a thousand miles, to New York.

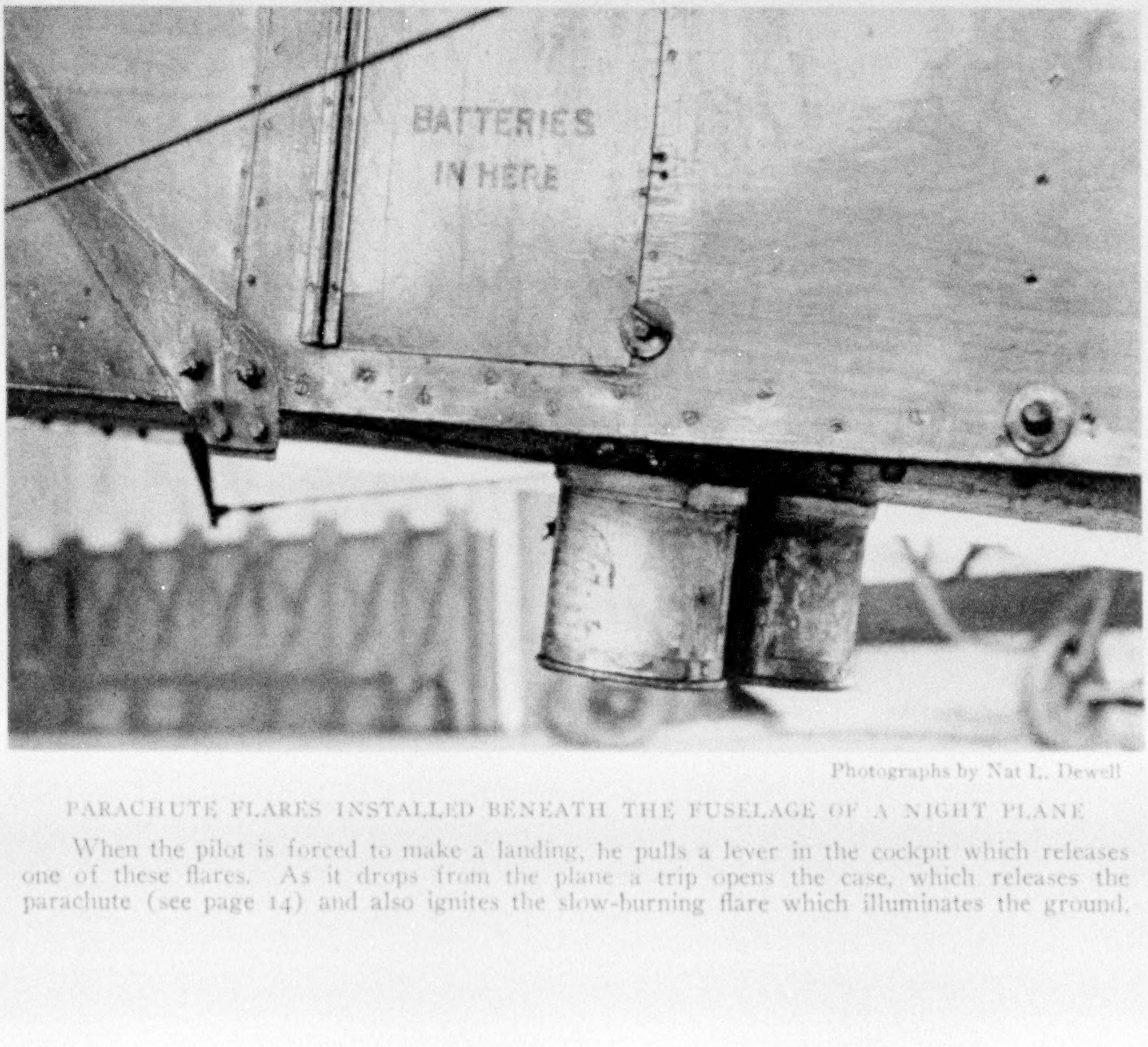
THE SENIOR MAIL PILOT HAS FLOWN 300,000 MILES

"Who's due in tonight?" I asked the beacon attendant, who had climbed up beside me on the narrow platform.



REPAIRING A CASE CONTAINING A PARACHUTE AND FLARE

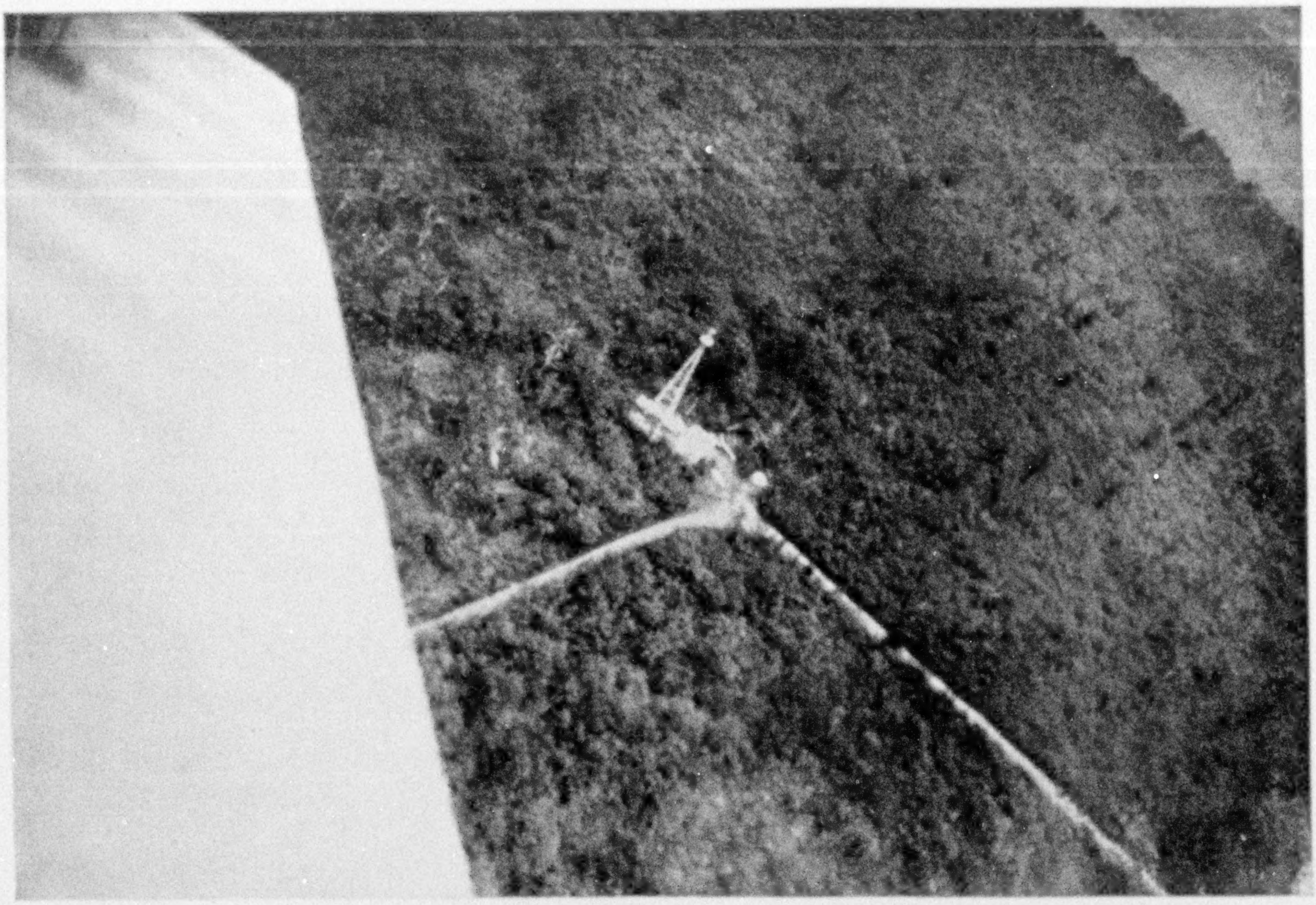
Two flares are carried for possible use in forced landings at night. They have proved indispensable and have been the means of saving several pilots' lives, as well as often preventing much damage to equipment when landing on strange fields.



Photographs by Nat L. Dewell

PARACHUTE FLARES INSTALLED BENEATH THE FUSELAGE OF A NIGHT PLANE

When the pilot is forced to make a landing, he pulls a lever in the cockpit which releases one of these flares. As it drops from the plane a trip opens the case, which releases the parachute (see page 14) and also ignites the slow-burning flare which illuminates the ground.



Photograph Courtesy U. S. Post Office Department

ONE OF THE ROTATING BEACONS ALONG THE AIR MAIL ROUTE IN PENNSYLVANIA

Such lights are placed on the summits of the razorback Allegheny Mountains as well as at the emergency fields in the intervening valleys.

"E. Hamilton Lee," he replied, "senior pilot in the mail. I guess Lee has done more flying and had less crack-ups than any other pilot in the service. Flown over 300,000 miles with the mail, and not all of it, by any means, on starlit nights like this.

"I remember one midnight last March when Lee brought the mail in from Chicago. The weather was off on a late winter spree and as dark as the inside of a cow.

"Lee picked up the storm near the Mississippi, but kept poking along, hoping for better weather. A 'buckaroo' wind was blowing, as full of holes as a Swiss cheese, and Lee was up against the safety belt 'pulling leather' much of the time. When he'd turn on his landing lights, all he could see was snow and sleet streaming between his wings.

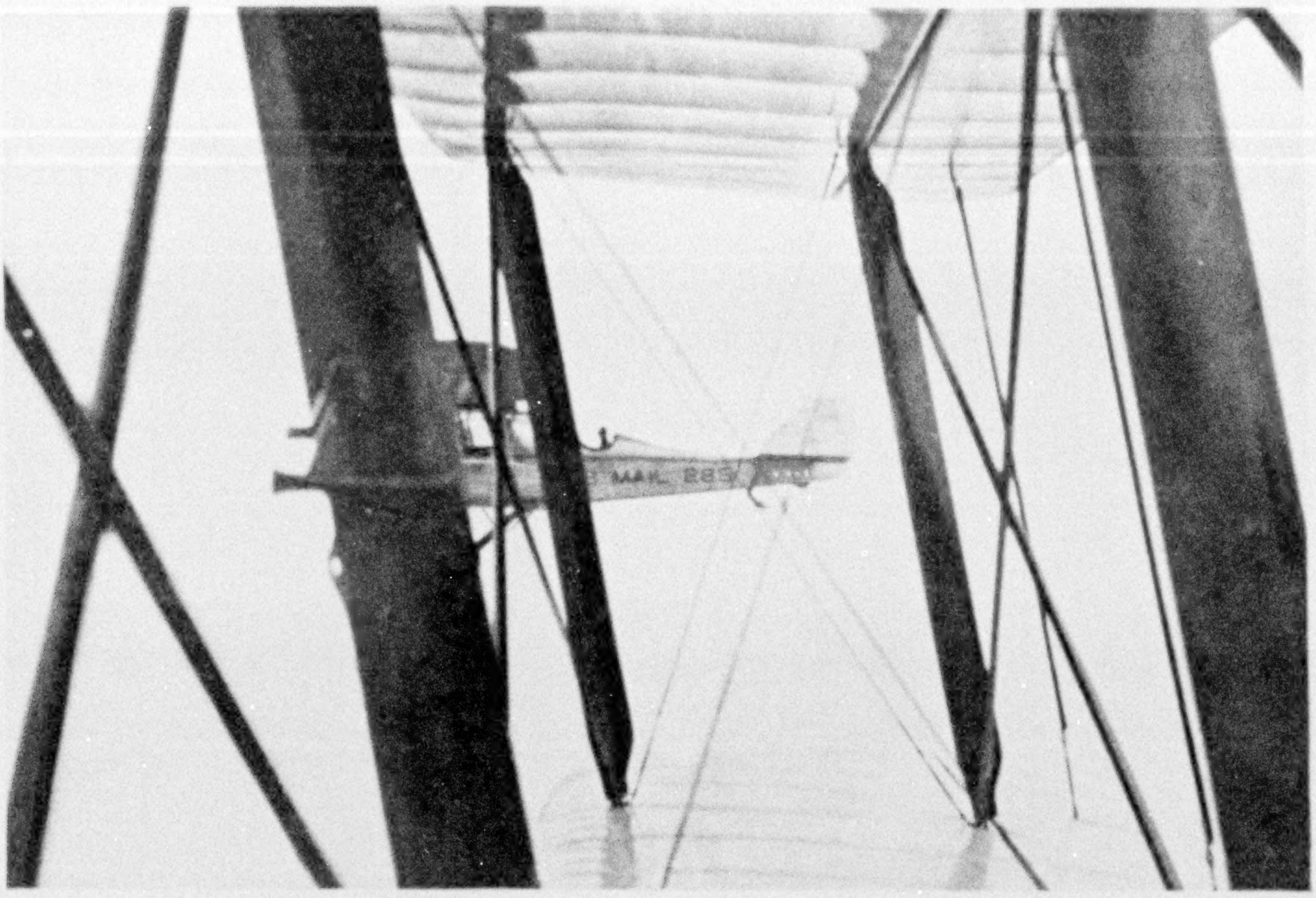
"After a while he guessed he'd better 'sit down.' He kicked off a flare; but the can was slow dropping out and the parachute caught on his tail skid, under the fuselage. Still, it lit up a pasture enough, so he got down all right.

"The longer he waited, the colder and wetter he got. Back he'd go 'upstairs' under a 200-foot ceiling, and hedge-hop along 20 miles or so, to the next emergency field. If we could have put through a telephone message, we would have ordered one of the field caretakers to flag him down with a couple of red fusees; but the wires were all down with the sleet.

"When still about 60 miles out, pitch dark and still storming, his motor quit—and he had already dropped both parachute flares! Reaching down instinctively, he switched on the emergency tank of gas, and the engine picked up again. The air-pressure check valve had frozen, so he had to pump gasoline by hand the rest of the way in!

A RECORD BOARD KEEPS TRACK OF PILOT AND SHIP

"We'd given him up, when suddenly we heard his motor spitting and barking overhead and barely got the floodlight on before he was rolling up to the hangar, through slush a foot thick. A wetter, more disgusted pilot I never saw. You



Photograph by Mechanic C. M. McCormick

TEACHER AND PUPIL OF THE AIR MAIL

When a new pilot is being trained for a run, he trails the regular Mail plane on several trips, in order to become acquainted with the course, before he is entrusted with the mails.

noticed that record board in Colyer's office, did you?"

I recalled having seen in the Superintendent's office, at the foot of the beacon tower, a list of the main fields in the Central Division — Chicago, Iowa City, Omaha, North Platte—with the names of the pilots and numbers of the ships at each place, suspended from hooks, on cardboard plaques (see page 25).

"Well, Lee plunked down, wet flying suit, parachute, and all, in a chair facing that board, and just stared at the wall, too tired and mad to talk. We hung around, scared to speak to him.

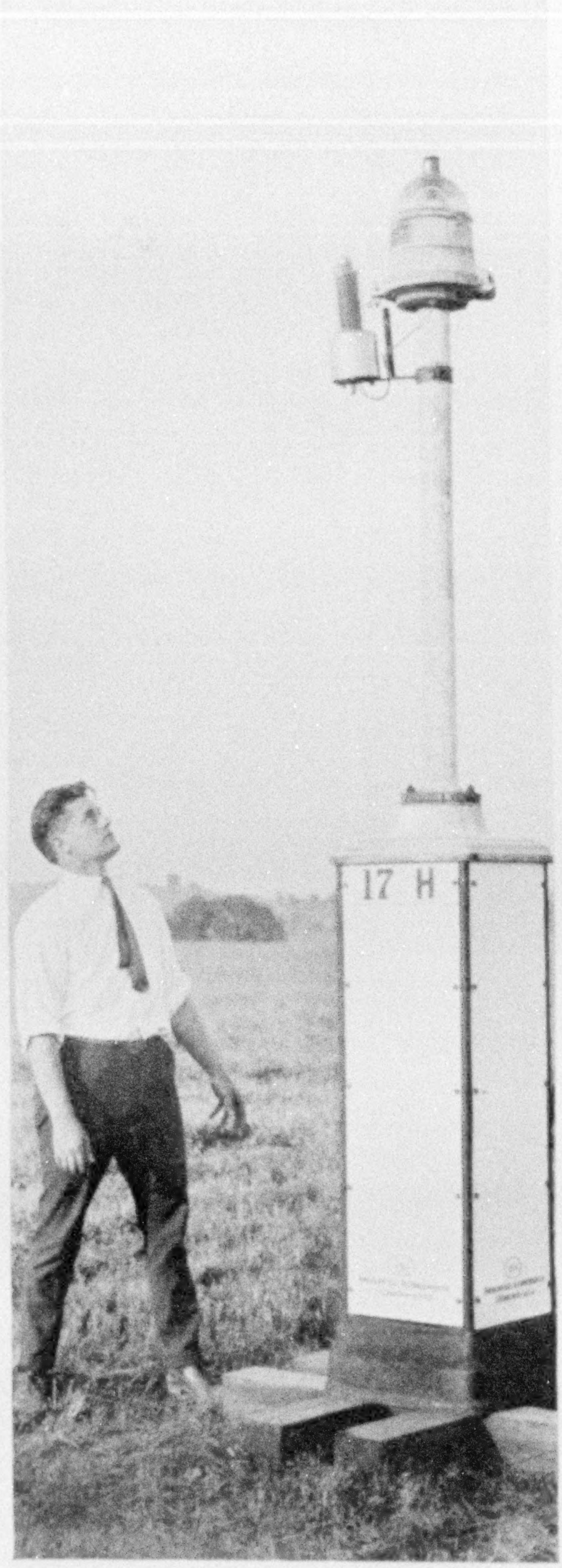
"All at once he caught sight of the plaque with his name, still hanging in the Chicago list. 'By gosh, I'm in Omaha,' he cried, and darting up, snatched the card off the hook, moved it over two rows, and dropped back in the chair.

"Then something about another plaque in the Chicago column caught his attention: '335,' it read, the number of the plane in which he had just fought for five hours through 430 miles of snow and sleet and darkness. This was the crowning indignity. 'What's more, I didn't walk, either!' he shouted, and, stalking back to the board, flipped off the offending card and hung it in its proper place under his name.

"There comes Lee now," the attendant added. Straining my eyes in the direction indicated by his outstretched arm, I made out two tiny lights, like truant stars, slipping through the dark night along the shadowy bluffs, across the "Great Muddy."

Below us, on the cement mat, the waiting group of mechanics sprang into sudden activity. Three formed a human chain before the relay plane, which stood by the hangar door, and at the sharp cry of "Contact!" lunged forward to drag the propeller through its arc, leaping aside as the metal blades caught up the light in a whirling disk and the 400-horsepower motor barked out its deep-toned assent.

With a sputter and splash of flame, the great three-foot French floodlight at the base of the beacon tower flung its brilliant level blanket of light across the field, sparkling in the dew-laden grass and roll-



Photograph by Nat L. Dewell

A ROUTING BEACON EQUIPPED WITH A SUN VALVE

The ingenious device projecting from the left of the light operates automatically. As soon as the sun sets, or when there is a dense fog, the beacon is turned on; as long as the sun shines on the valve the beacon is cut off.

ing the shadows far back toward the border (see illustration, page 16).

Against the paled stars a vague outline of the onrushing plane became visible, grew rapidly distinct, the glowing eyes of the landing lights marking the extremities of the wings (see page 15), while the muffled throb of the engine swelled to an enveloping roar.

THE RELAY COURIER TAKES OFF

Down an invisible sloping path over the boundary lights the night messenger came gliding, slipped suddenly into brilliant relief in the glare of the floodlight, skimmed over the sparkling grass, and settled easily to rest. The throttled motor bellowed hoarsely again, as the pilot turned toward the hangar and taxied swiftly to the mat. Mechanics swarmed out to take over the plane, throw out the score or more of heavy mail sacks, and transfer them to the waiting courier.

In a few short minutes the relay plane swung away from the mat with an impatient roar, streaked over the field, and soared into the somber shadows beyond the border lights, speeding rapidly out of sight toward the winking stars behind the low-lying Nebraska hills.

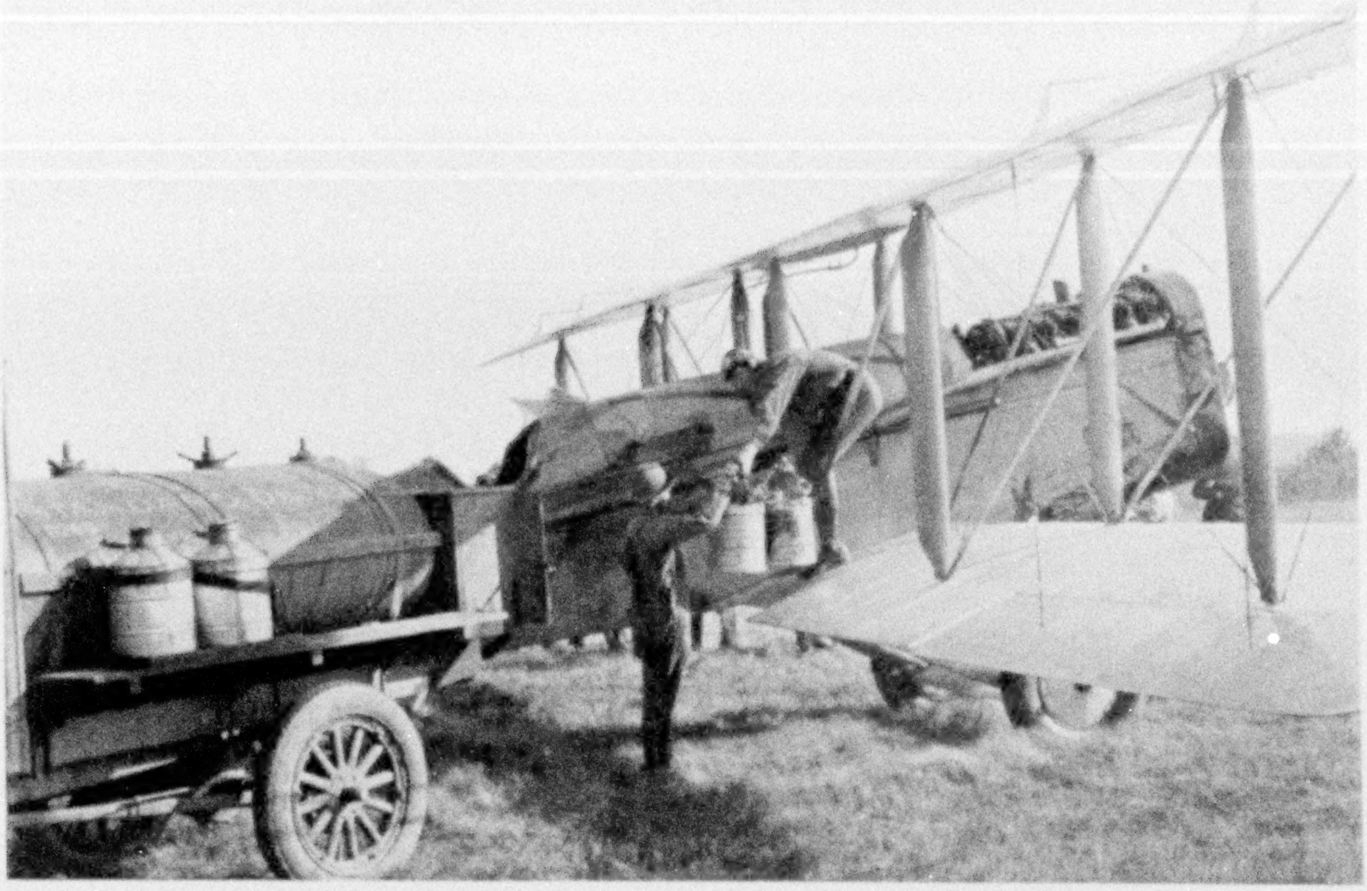
With a final fitful flicker the great landing arc withdrew its warm blanket of light, the lurking shadows poured in between the boundary lights, and the beacon above my head took up once more its restless, far-flung vigil.

Lange was off in the night for Cheyenne with the transcontinental mail. Somewhere, an hour later, among the stars above the wide Platte, he would pass the eastbound pilot, blinking his lights in fraternal greeting, as their combined speeds rushed them by one another at more than 200 miles an hour.

PATHFINDERS OF THE PAST PLODDED THEIR WEARY WAY ALONG THIS ROUTE

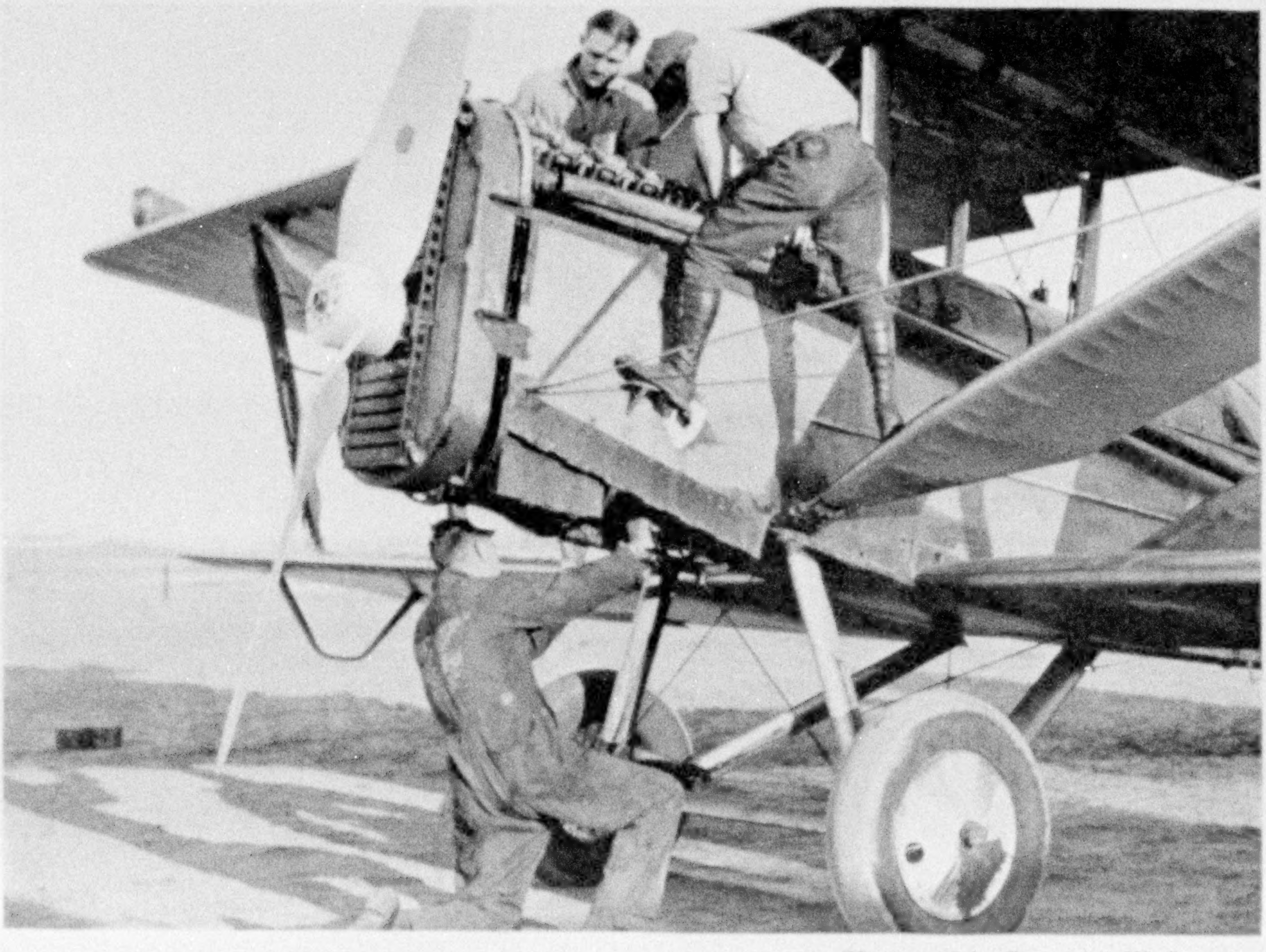
It was now past midnight, but I was loath to desert my watchtower. Peace and quiet had settled down over the darkened fields, brooding in the cool gloom along the Missouri basin and bathing in faint, starry light the low, wavy silhouette of the distant bluffs.

Long, lingering streamers of the northern lights flung up their mysterious banners behind the lost horizon, dimming the



Photograph Courtesy U. S. Post Office Department

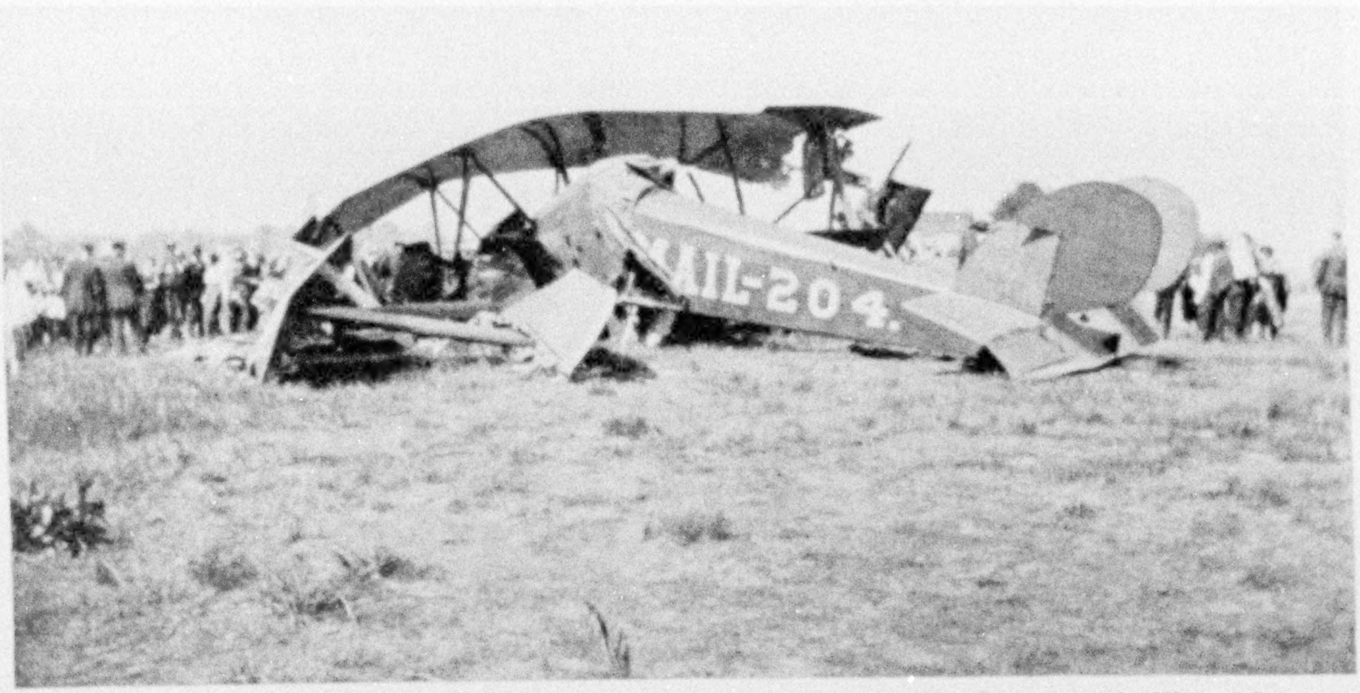
TAKING ON GASOLINE AT AN EMERGENCY FIELD



Photograph by Captain A. W. Stevens

MECHANICS CHECKING OVER THE ENGINE

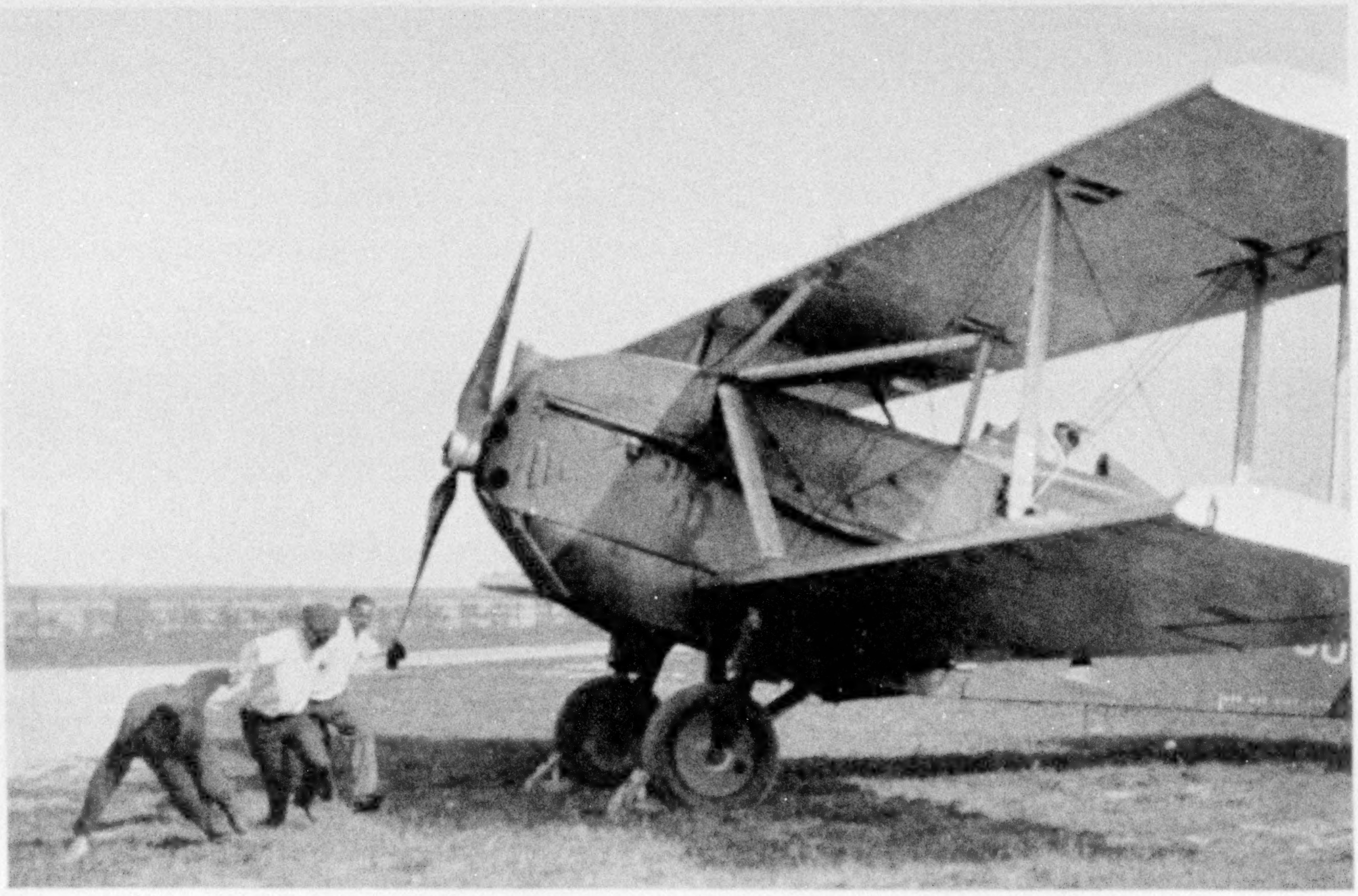
The success of an air line depends largely upon the care and thoroughness of work done on the ground before each flight begins. Every plane is carefully checked over before and after each trip. Note one of the landing lights on the tip of the upper wing. Metal propellers, as seen here, are rapidly replacing the former metal-tipped wooden propellers.



Photograph by Willard Schmitt

ONE OF THE MOTORS OF THIS PLANE STOPPED ON ITS TAKE-OFF

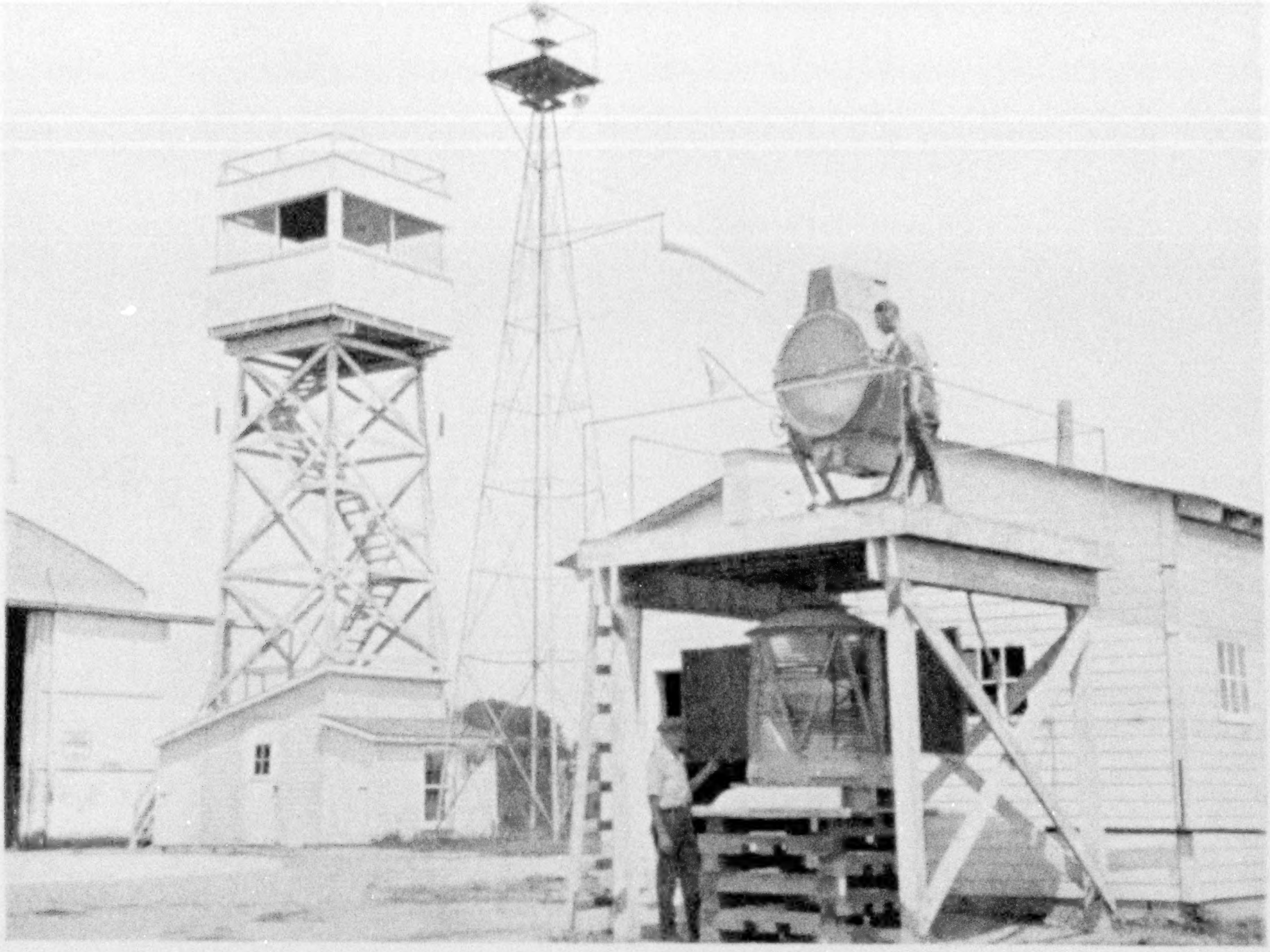
The pilot escaped, but the mechanic was killed. This was a type of bimotored airplane used for a time in the early days of the Air Mail.



Photograph by Captain A. W. Stevens

STARTING THE MOTOR OF A MAIL PLANE (SEE TEXT, PAGE 8)

Note the propeller, made of duralumin metal. After 100 hours of service (about 10,000 miles), motors are taken out of the planes for overhauling. The planes are sent to the central repair shops at Chicago (Maywood) after 750 hours, or about 75,000 miles of flying, where they are put in condition as good as new at a cost of about $2,000.



Photograph by Captain A. W. Stevens

FLOODLIGHT, SEARCHLIGHTS, AND WIND MARKER AT IOWA CITY, IOWA

The airway between New York and Rock Springs, Wyoming, 1,886 miles, was lighted for night flying at a cost of $514,405, or an average cost of $273 per mile. The annual maintenance cost for this lighted route is $157 per mile.

lower stars. An impalpable gossamer mist slept in the dewy grass, gleaming under each swift, silent passage of the sweeping beam.

I thought of the legion of travelers that had crossed that broad river to push on in hot quest or in weary indifference toward the beckoning West—of the lonely, venturesome trapper devouring his evening meal uncooked, lest the light of his fire should attract the eye of prowling Indian bands; of Lewis and Clark poling their slow way past snags and sandbars to explore a route to the Pacific; of Pike, who had so far misread the future of these fertile Nebraskan plains as to pronounce them "a desert barrier placed by Providence to keep the American people from thin diffusion and ruin"!

On those low bluffs across the sleeping valley the homeless Mormons and the drifting Potawatomi had once sought temporary shelter, in friendly accord wrought out of common misery and persecution. The last of those early Potawatomi has long since joined his fathers in the "happy hunting ground," and over the long Mormon trail across the rolling plains the winged couriers of the Mail now cut the hours to minutes in their swift flight from coast to coast.

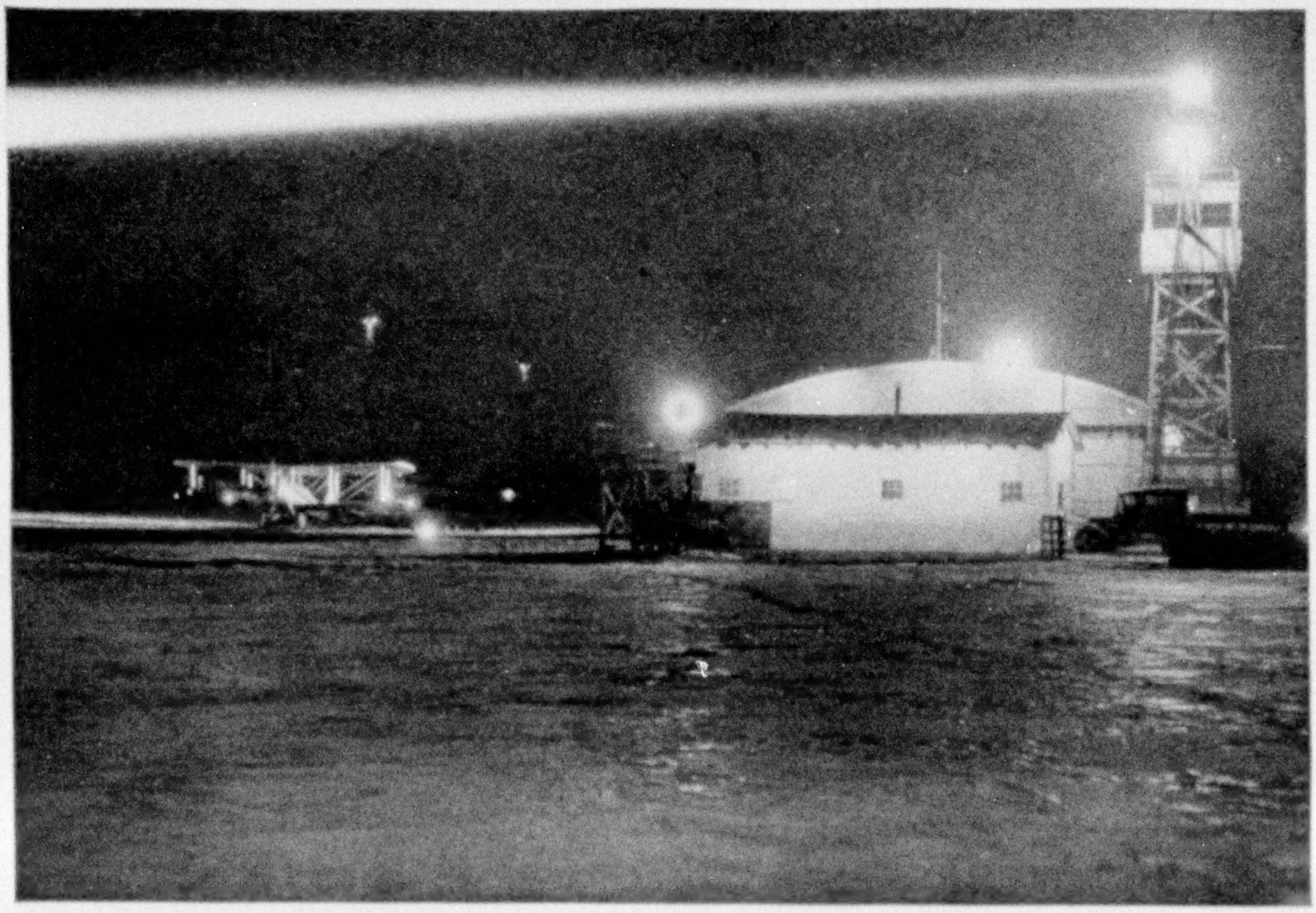
It was in the darkest hours of the night that I finally scrambled down the tower, to find the hangar crew bestirring itself to receive the eastbound mail; and as I dropped off to sleep on a hard little cot in the pilot's room, the drone of the incoming plane sounded faintly across the hills, like a rumble of distant thunder.

Late the next afternoon I picked up a passenger and pushed on to North Platte.

Peter Berger, field manager at Omaha, is one of the most experienced mechanics in the Mail, with the insidious virus of flight coursing hot in his veins. The sight of the empty rear cockpit in my plane, tagged for the Pacific coast, completely overpowered him. Throwing all caution

THE RELAY PLANE AT IOWA CITY FIELD, IOWA, WAITING FOR THE NIGHT COURIER

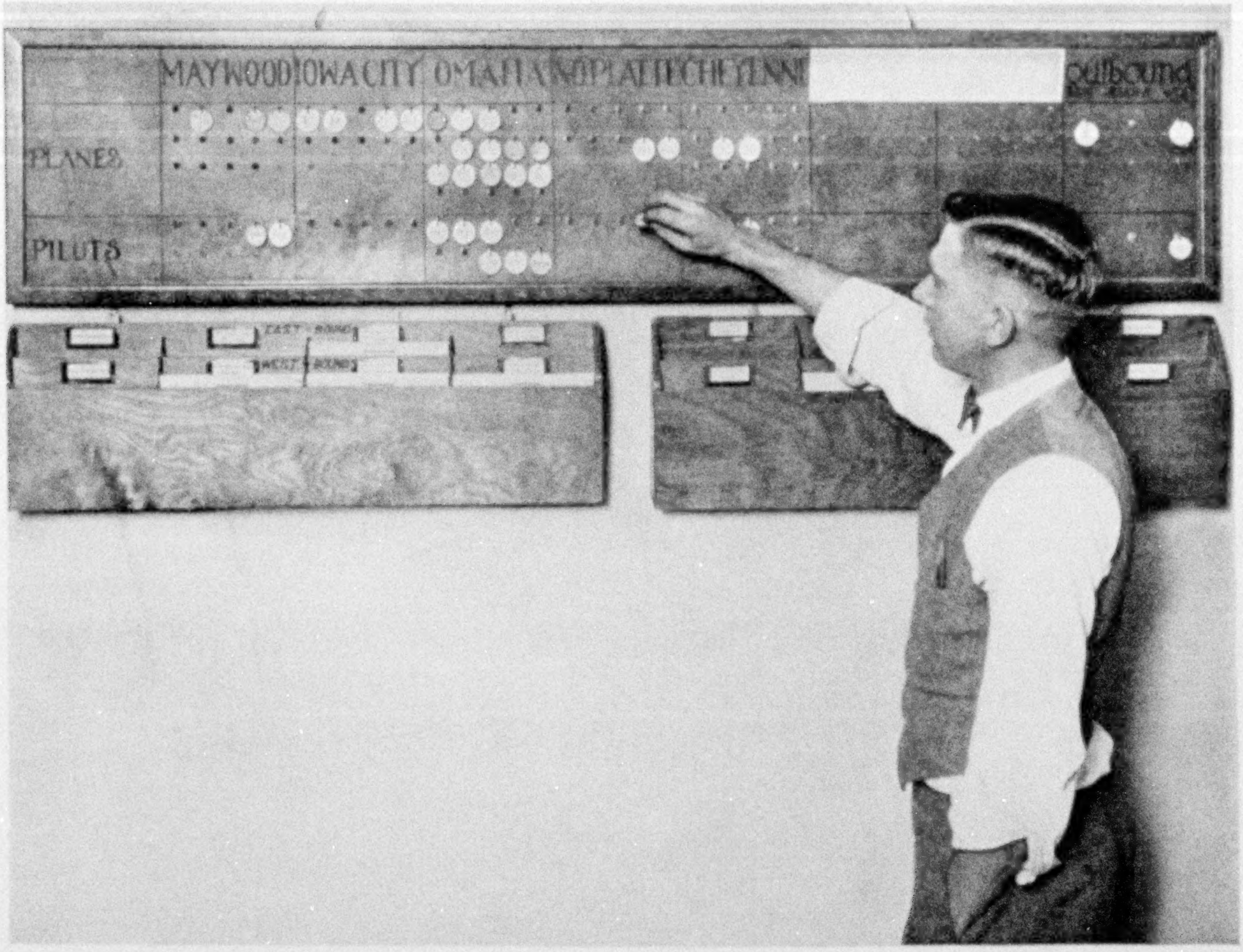
The broken white line on the photograph was caused by a flashlight in the hand of a mechanic who crossed to the plane during the time the photographic plate was exposed.



Photographs from D. B. Colyer

FLOODLIGHTING AND BEACONS AT A MIDWESTERN AIR MAIL FIELD

The rotating beam, "like a thin saber of fire," flashes far out along the route, guiding the night flyer's course.



Photograph by Nat L. Dewell

THE AIR MAIL DISPATCH BOARD AT OMAHA

In the Superintendent's office, at the foot of the beacon tower of the Omaha field, is this board, with a list of the main fields in the Central Division. The names of the pilots and numbers of the planes at each place are on cardboard plaques suspended from hooks (see text, page 19). The Air Mail Field of Omaha is at Fort Crook barracks, 12 miles from the heart of the city.

to the winds—for I am only an Army, not a Mail pilot—he at once begged the Superintendent for ten days of his annual leave, kissed his wife a hurried good-bye and vaulted into the seat, shouting, "California, here we come!"

INVISIBLE AIR LANES LINK EAST AND WEST

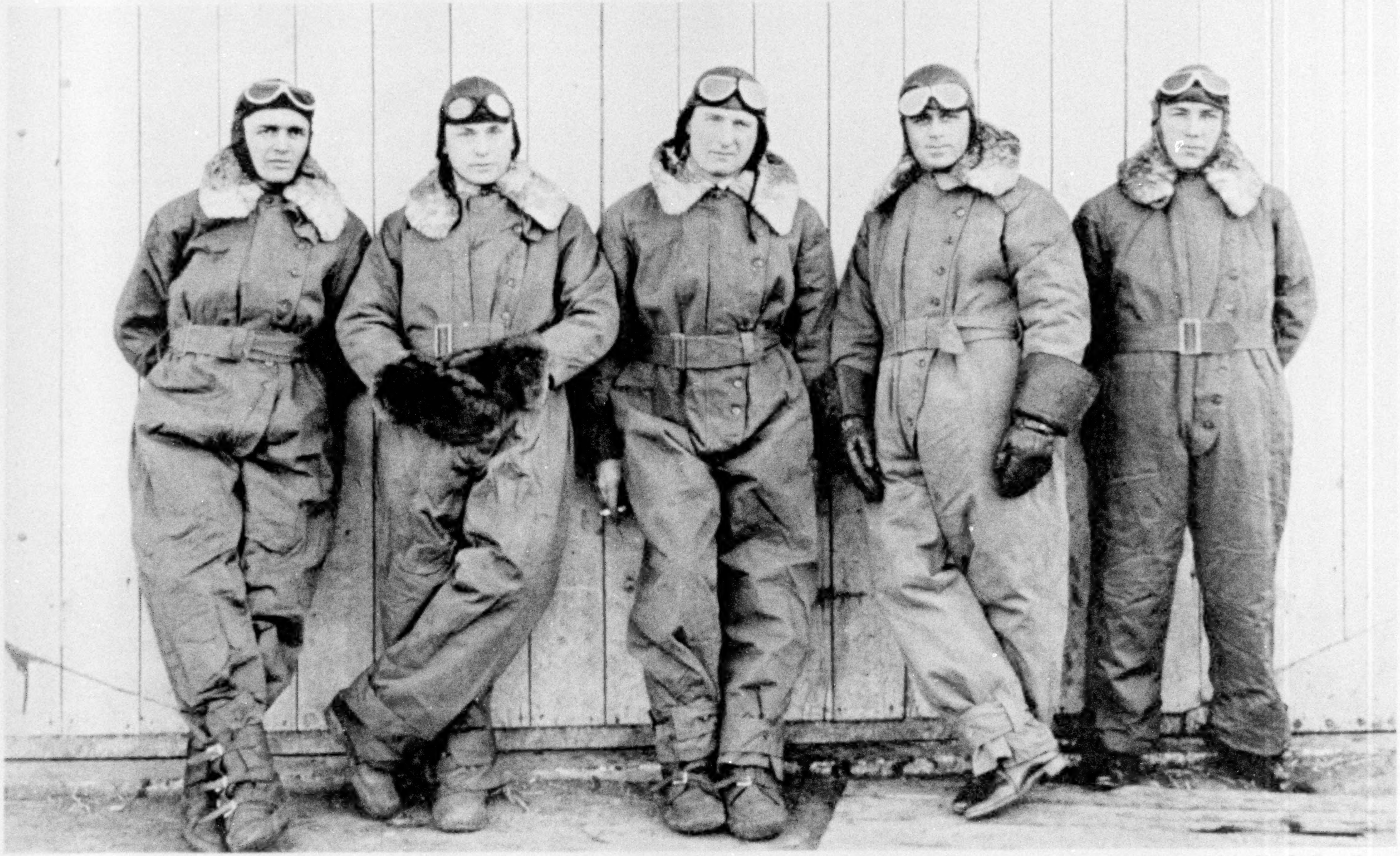
Having flown with Berger before, I was sure I had struck a good bargain. As for Pete, his delight knew no bounds. He leaned far over the side of the cockpit, waving wildly at the farmer lads plowing in the fields.

The sight of the pigs and the grazing horses and cattle frantically scuttling aside before the onrushing thunder of our engine filled him with unholy glee. His broad face was wreathed in a happy grin that lit up the whole State of Nebraska.

Below us the dappled earth, alternate black and green, spread out like a vast inverted bowl, a spacious lawn "full of sunlit dancing spaces." The growing grain lay flattened under a strong north wind, waving rows of green sending ripples of light flowing under our bow, like water over an emerald washboard. Little tubby cloud-boats came scudding by, with cream-puff tops and dark flat bottoms, in endless, close-set rows, like battle cruisers on maneuver (see, also, page 7).

So we followed the westbound section lines, along that invisible lane binding the Nation, through the "uninterrupted navigable ocean that comes to the threshold of every man's door."

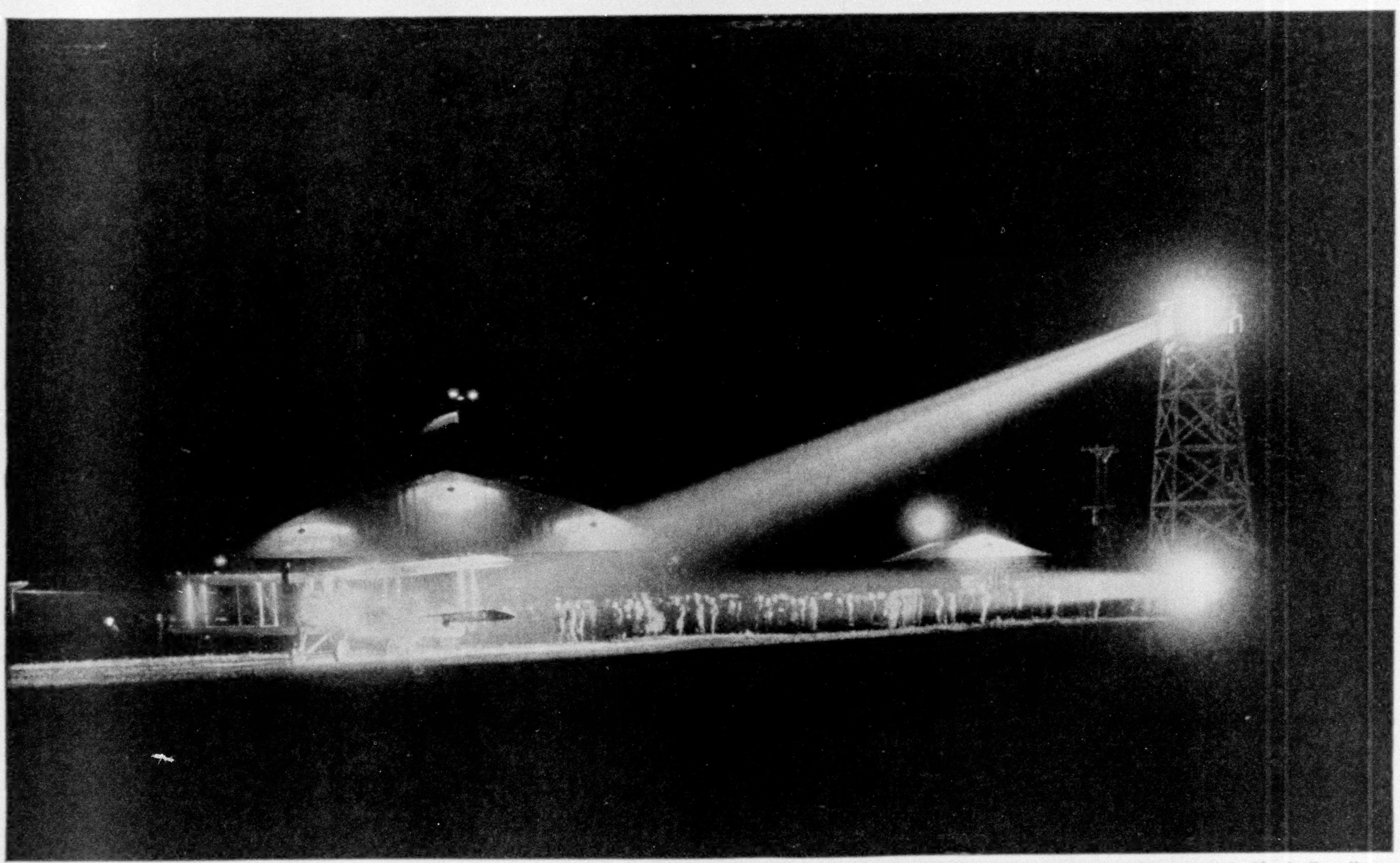
Early the following morning we were off for Cheyenne. Here began in real earnest those desolate plains over which the bellowing of uncounted buffaloes once



Photograph by Nat L. Dewell

A GROUP OF FAMOUS AIR MAIL PILOTS DRESSED FOR WINTER FLYING

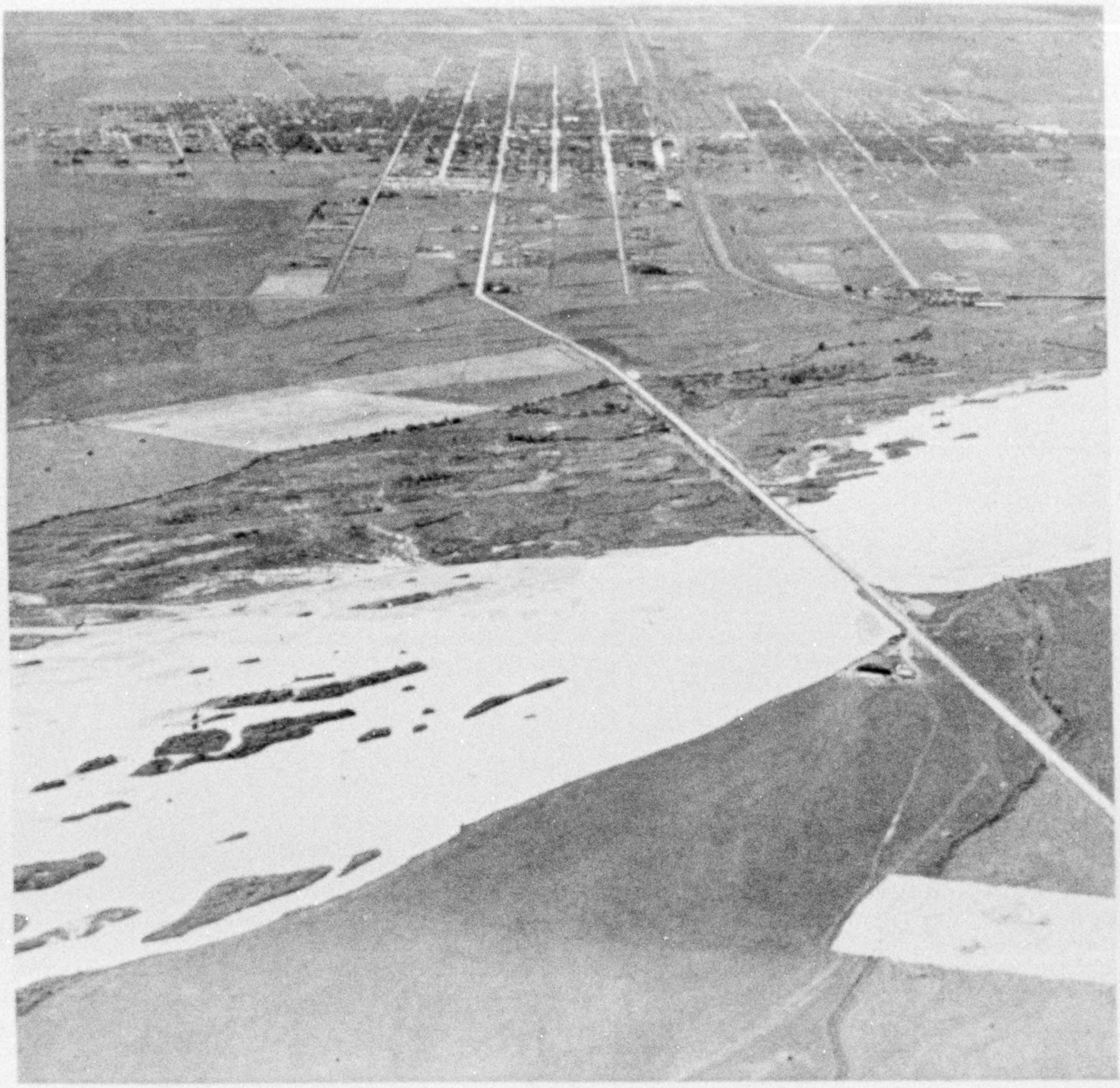
From left to right, Jack H. Knight, Clarence C. Lange, Leland H. Garrison, and William C. Hopson; on the extreme right, Andrew N. Dunphy, formerly Superintendent of the Central Division, at Omaha. There are 745 employees in the Air Mail Service, with an average salary of $1,764. There are 46 pilots, who receive a base pay ranging from $2,000 to $3,300, and in addition five, six, or seven cents per mile flown, depending on the difficulty of the particular route. For night flying the mileage pay is doubled. The average earnings for each pilot during the past fiscal year were $6,760.



Photograph by Nat L. Dewell

THE OMAHA FLYING FIELD AT NIGHT

Pilots and planes are changed six times en route between New York and San Francisco: at Cleveland, Chicago, Omaha, Cheyenne, Salt Lake City, and Reno. The average flight for each pilot is 381 miles. The longest leg is between Omaha and Cheyenne, 476 miles; the shortest is between Reno and San Francisco, 184 miles, where the pilots reach an altitude of from 10,000 to 15,000 feet above sea level while crossing the Sierra Nevada (known in Air Mail parlance as "The Hump"). This transcontinental service is daily and, together with the added New York-Chicago overnight service, the scheduled yearly mileage is 1,945,450 miles.



Photograph by Captain A. W. Stevens

THE AIR MAIL FIELD AT NORTH PLATTE, NEBRASKA

The field is in the foreground and the mail plane hangar is close by the highway bridge. The town appears in the distance. Note the numerous islands in the Platte River.

echoed like the ocean beating on a distant shore.

Our route skirted the flat bed of the South Platte, where the shallow water divides into a dozen threadlike sluices, broken by little wooded islands and gleaming stretches of quicksand. Occasional tiny beacon markers in the open fields along the bank marked the night mail's course.

A short half hour out we skimmed by Ogallala, once the Gomorrah of the cattle trail, now a respectable-appearing little city, with church spires projecting among its scattered trees, where once had stood long rows of saloons and gambling dens.

Here it was that the "Long Drive" of Texas longhorns* used to cross, out of Texas past Stinking Water Creek, to the Crazy Woman branch of Powder River.

> "Ten thousand cattle straying,
> As the rangers sang of old,
> The warm chinook's delaying,
> The aspen shakes with cold."

And the weary cow-punchers would urge on the heat-maddened herds with "Ip-e-la-ago; go 'long, little dogies; you'll make a beef steer by and by!

Here, too, the old Oregon Trail wound through shallow gulches to the North

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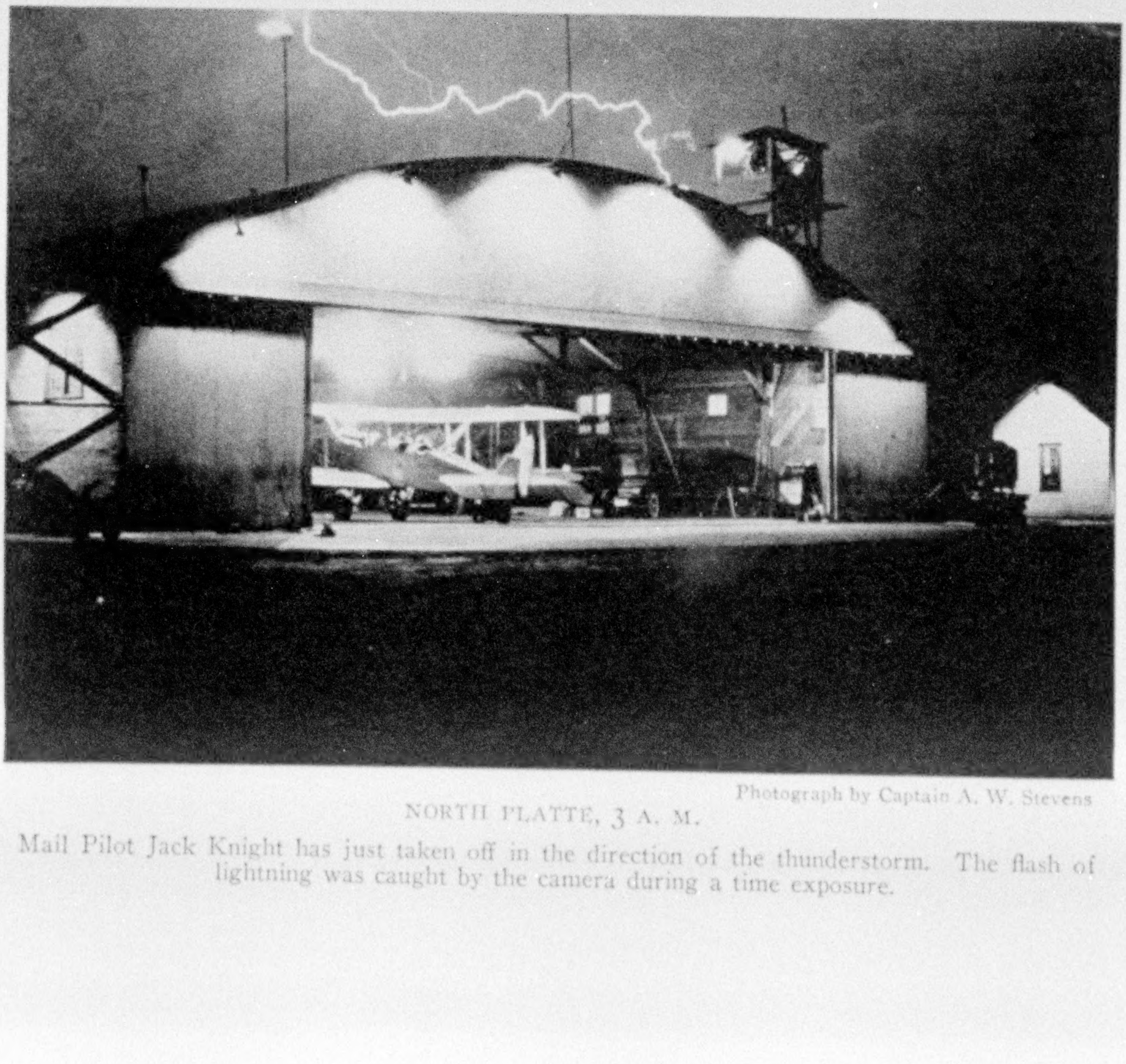
* See "The Taurine World: Cattle and Their Place in the Human Scheme—Wild Types and Modern Breeds," in the NATIONAL GEOGRAPHIC MAGAZINE for December, 1925.

Photograph by H. A. Collison

LESTER BISHOP'S LANDING ON GRANGER'S BENCH (SEE TEXT, PAGE 46)

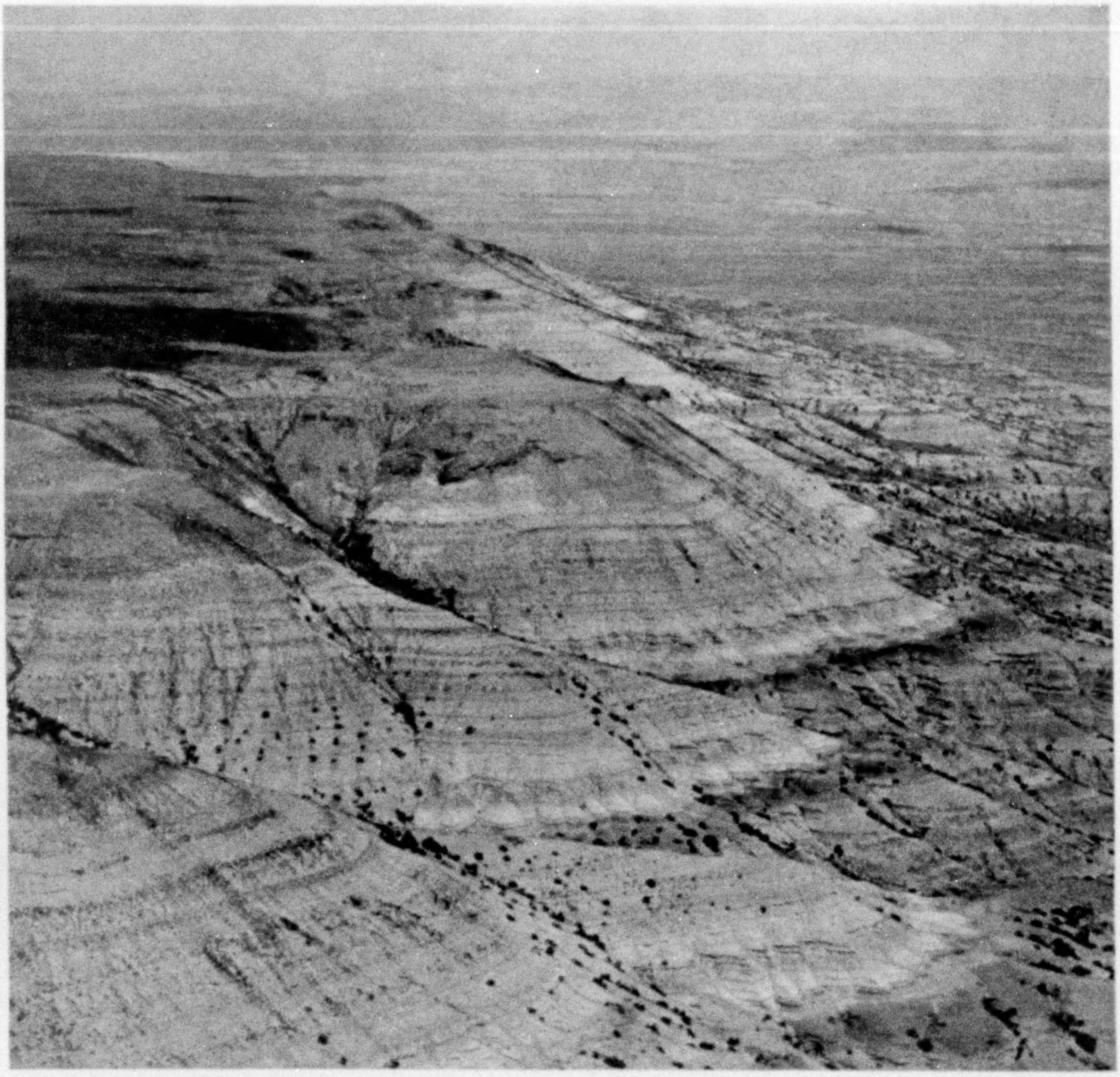
H. A. Collison flew the plane off three weeks later, after 31 attempts. New planes with much improved performance are now being tested by the Post Office Department to replace its present De Haviland plane, which has been the standard for five years. The average price asked by the manufacturers, in lots of 10, is about $14,000.



Photograph by Captain A. W. Stevens

NORTH PLATTE, 3 A. M.

Mail Pilot Jack Knight has just taken off in the direction of the thunderstorm. The flash of lightning was caught by the camera during a time exposure.



Photograph by Captain A. W. Stevens

LEAVING ROCK SPRINGS, WYOMING, THE AIR MAIL PLANE PASSES BY THIS HIGH TABLE-LAND

The winds from the west, pouring over ledges into the valley north of Rock Springs, in which the Air Mail Field is located, make climbing out of the field difficult and dangerous at times. It was on the east slope of this table-land that one Air Mail pilot was sucked by the winds into snow banks. The plane was not injured, but was subsequently taken apart and reassembled at the Rock Springs hangar. A picture of this forced landing was shown in a previous issue of the NATIONAL GEOGRAPHIC MAGAZINE (July, 1924, pages 26 and 114).

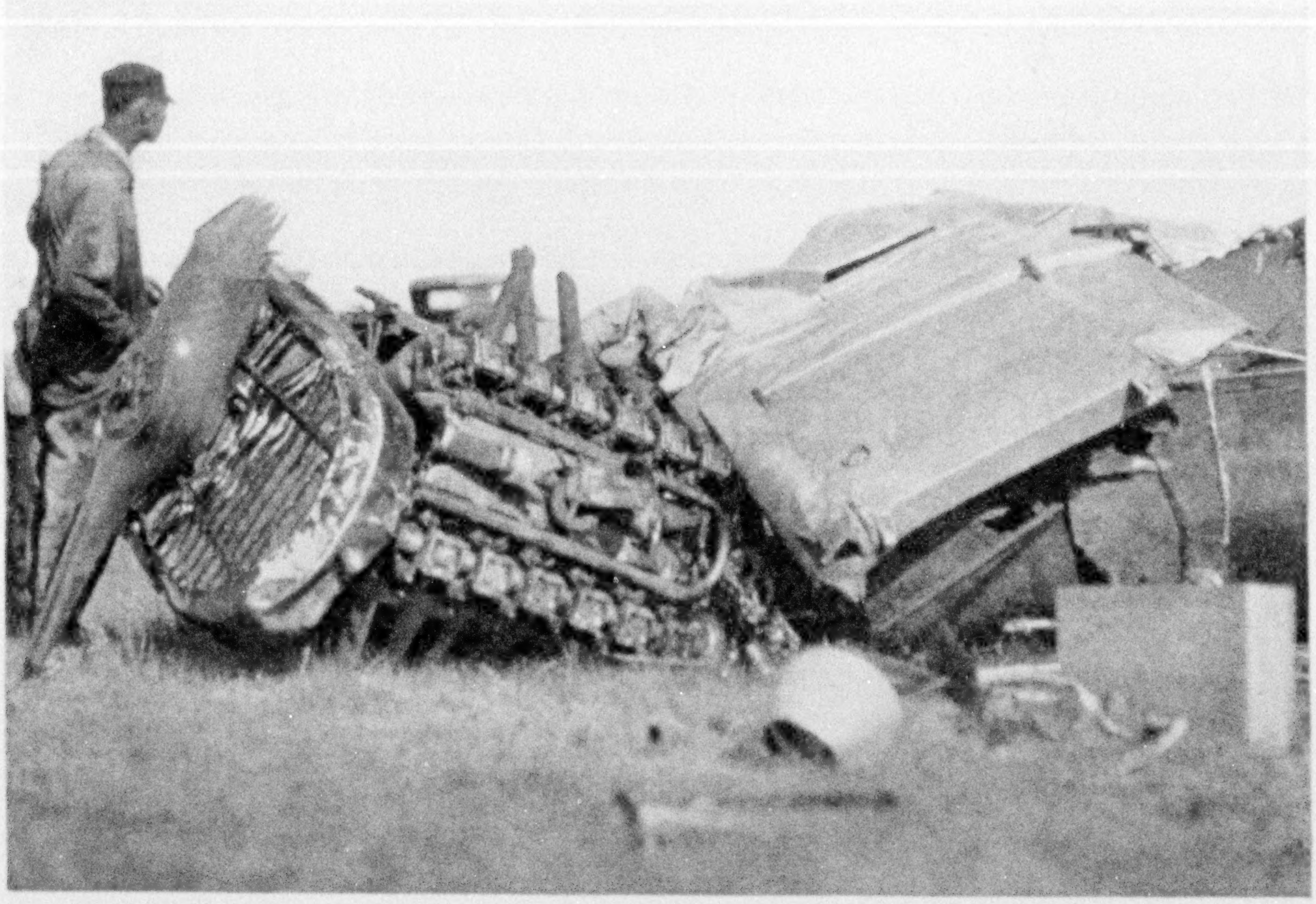
branch of the Platte, over country "all road" and said to be "not such a bad place for men and dogs, but Hades on women and oxen."

Many a huddled caravan, encamped on the banks of the Platte, had been roused by the murderous war-hoops of Sioux or Pawnee; or had been startled out of heavy sleep by the screams of some stricken and delirious emigrant crying—"Where's next water? Team—give out! Hot, hot ——! Stop the wagon—stop the wagon!"

From our cool perch in the sky, under the drifting fringes of a low bank of cloud, the stories of hardships endured by these earlier travelers seemed as remote as the lessons of the Old Testament.

WHERE A NIGHT PILOT "PULLED THE WHISKERS OF DEATH"

There we were, flinging along in joyous comfort, a hundred miles an hour, under the overhanging cloud, dashing through occasional streamers of mist like bathers sporting in ocean spray, while a



Photograph from D. B. Colyer

THE EFFECT OF A HURRICANE ON A NIGHT MAIL PLANE

The pilot "pulled the whiskers of Death"—and escaped unhurt! (see text below).

thousand feet below, the pale surface of the South Platte glistened in its desert valley and the silent, undulating plains spread out to meet the sky.

Eighty-five miles from North Platte, Pete drew my attention to an emergency field slipping by under our wings—Chappell, Nebraska, the scene of one of the strangest accidents that has ever occurred in the Mail. Here, on a stormy July night, pilot Frank Yager not only "pulled the whiskers of Death," as the Moslems say, but literally crawled in through the chinks between his closed teeth—and out again.

He had taken off from Cheyenne at 8:30 p. m., ahead of an approaching storm. One hundred and twenty miles east, over Lodgepole, the broken cloud ceiling above him had sealed up tight, shutting out the scattered light of the stars, and a strong head wind clutched at his plane, contesting every mile gained.

Arriving over the Chappell searchlight, he was about to press on, when the flashing beacon at Big Spring, twenty miles ahead, suddenly went out in the brightest part of its arc, completely eclipsed by an ominous black cloud rolling swiftly down upon him across the dark prairie.

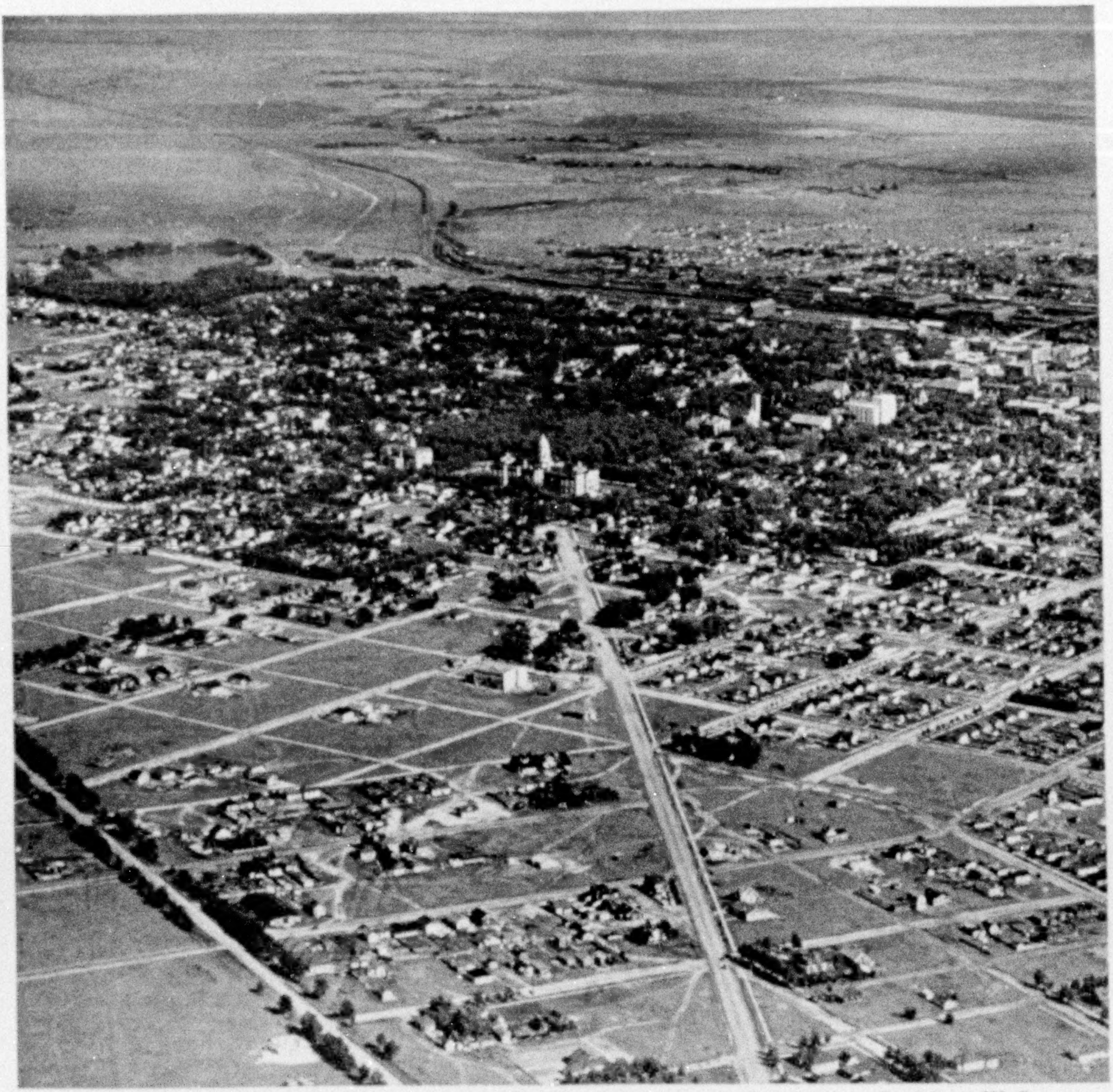
"Guess the 'old man' had better sit down till this fellow gets by," Yager muttered to himself. He banked, and started to glide in across the fringe of boundary lights that outlined the Chappell emergency field.

At that instant the hurricane struck. "My intention was to keep my balance, and clear of the ground," his official report reads. "It didn't last long. Found myself sitting on the prairie clear of the ship, with a terrific wind blowing from the west, exactly opposite to its direction the minute before. All I could see of the wreck was the lighted cockpit turned toward me.

"Didn't feel any effects of being hurt, so groped for my flashlight in the cockpit, turned out the lights, and stumbled down the hill to the beacon tower. I regret to report that the plane is one of the most thoroughly wrecked aircraft I ever saw."

The mail was an hour late reaching Omaha that night.

Pete got a stirring welcome when we landed at Cheyenne, two hours out of



Photograph by Captain A. W. Stevens

CHEYENNE, WYOMING, WITH THE CAPITOL IN THE MIDDLE DISTANCE

The Air Mail now passes many of the cities through which the Pony Express once operated.

North Platte. The envious grease-monkeys crowded around to demand how he "wangled the graft." And when he indiscreetly confessed being bound all the way to the coast, I had to hustle him away to save him from sudden and awful death!

AIR PILOTS DISCOVER HIDDEN BEAUTIES IN BARREN LANDS

Cheyenne is the headquarters for the Mountain Division that stretches away over the Continental Divide, 400 air miles to Salt Lake. From the train it appears for the most part a dreary and tiresome waste. League upon league of desert prospect, barren buttes and sand cliffs rising out of the sage, while the hours drag wearily by and the far-away rugged ranges drift toilsomely across the horizon.

From the air the whole scene is transformed. There are hidden aspects of beauty in this unpromising land, like unmined gold, to rival any of the more manifest wonders one may find elsewhere. But one must take the air way to discover them.

One such we found in the Medicine Bow Range, lying west of Laramie Valley. Far south the snow-cap of Longs Peak seemed to float in the pale blue of the sky. To the north the majestic bulk of Elk Mountain (Big Horn) reared up grandly out of the plain.

From our floating swing at 12,000 feet,

Photograph by Captain A. W. Stevens

A STORM APPROACHING CHEYENNE, WYOMING

Fliers of the Air Mail Service start out into such storms day and night.

the Snowy Range stretching beneath us spread out its cool treasured secrets to view. Little lakes in the glorious wildness were set like mirrors among the ice-polished crags; massed regiments of firs and pines trooped up the canyons, their steep paths flecked by the plumes of crystal streams.

Out of a grassy upland meadow Medicine Bow River hurried over the shoulder of the range down to the level floor of the valley, a dwindling dark avenue of evergreens. It was on one of its forest-clad islets that Owen Wister's "Virginian" had spent his honeymoon; and beyond those dark clusters of oil derricks, standing out like tiny black pins, a group of cowboys once heard his drawling voice say, "Frawgs are dead, Trampas, and so are you."

PILOTS BRAVE DARKNESS AND BLIZZARDS IN MOUNTAIN PASSES

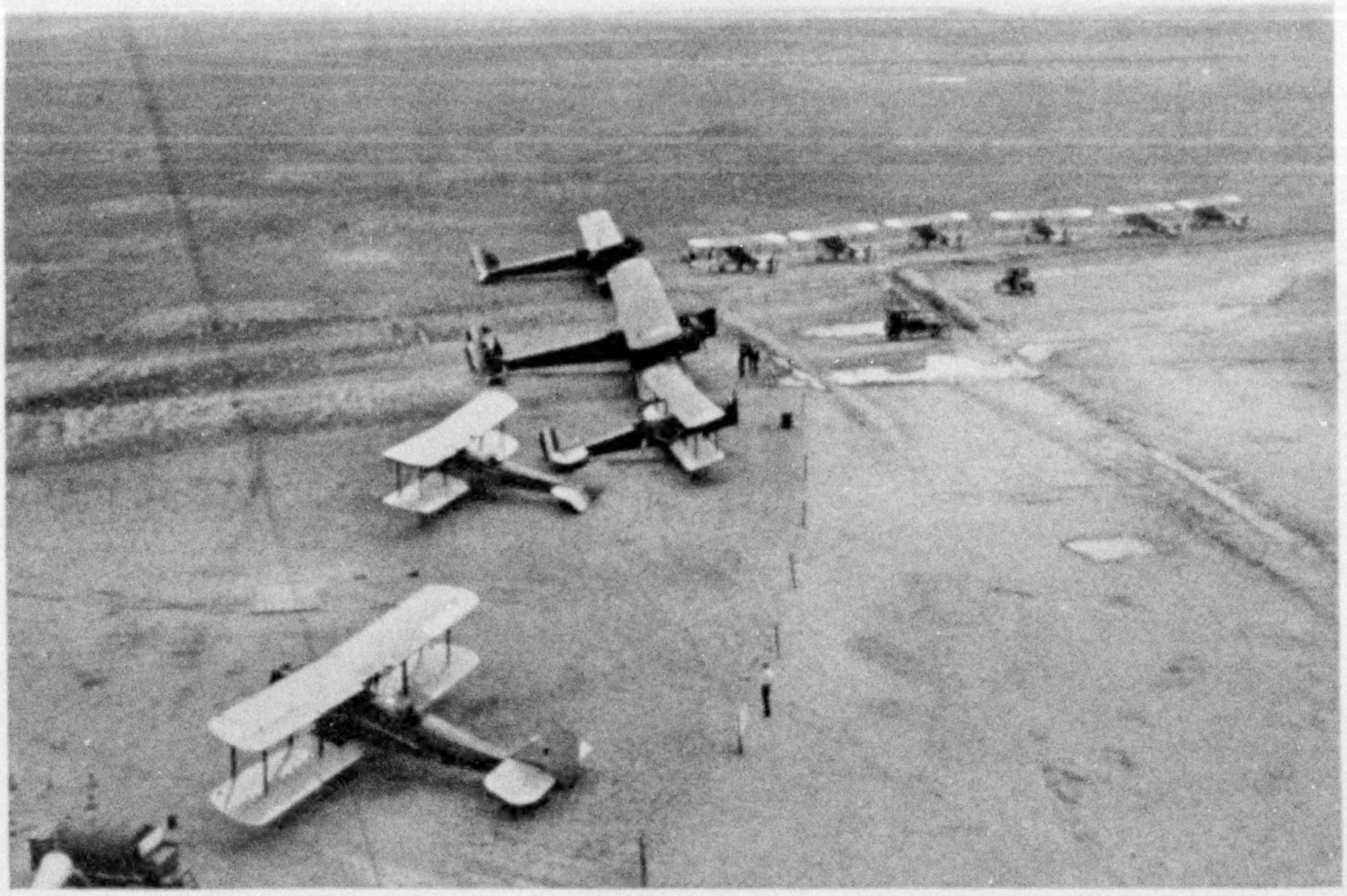
But the frowning beauty of these ranges makes little appeal to the Mail pilots, engaged in endless lonely combat in the dark, with man's ancient and uncompromising enemy, "winter and rough weather."

That sullen, lifeless belt of the Laramie Range, across the valley, rising 9,000 feet above the sea, has more than once clutched hungrily at a fleeting plane, only to have the pilot slip through its icy fingers. There Jack Knight had been caught in the canyon winds and flung against the mountain side, into a deep snowdrift.

The engine and propeller had buried themselves in the snow, while the entire fuselage had torn itself loose and rolled down the steep slope 80 feet, lodging against an exposed ridge of rocks. When Knight regained consciousness, an hour later, he found himself lying several yards from the cockpit.

Aside from bleeding freely from bad cuts on his face, a broken nose, and aches all over his body, there seemed to be nothing wrong. So he groped down the mountain side in the uncertain light of dawn, over snow and rocks, to a ranch house seven miles distant.

These pine-covered slopes beneath us, gliding by in the glorious light of a midday sun, had been the scene of Jimmie Murray's misadventure, one stormy spring five years ago. That was when the trans-



Photograph by Captain A. W. Stevens

ARMY BOMBERS AND PURSUIT PLANES ARE OVERNIGHT GUESTS AT THE CHEYENNE, WYOMING, AIR MAIL FIELD

continental mail route had just been opened and the idea of night-flying over this portion was as yet undreamed of.

Murray had attempted to pass south of Elk Mountain, through a rift in the lowering clouds. Advancing as cautiously as possible, he suddenly found himself flying in the midst of a raging snowstorm, the bristling carpet of treetops under his wings disappearing into a white wall ahead and sloping up more steeply than the plane could climb.

It was too late to turn back. With throttle full open, he felt the plane stalling under him, and as the topmost branches of a silver fir brushed his wheels, he cut both ignition switches and pancaked down "as gently as possible" into its snowy arms.

"The plane was very badly wrecked," Murray told me. "I crawled back into the cockpit and took out the compass, but it was broken and useless. There wasn't much to see, the storm was so thick, but I started off down the slope, slipping and plunging through two feet of snow.

"At dark I came on a little lake and spent the night there, under a fir tree, hoping that when the sun rose it would show me which way was east. But in the morning the snow was still falling heavily and no sign of the sun.

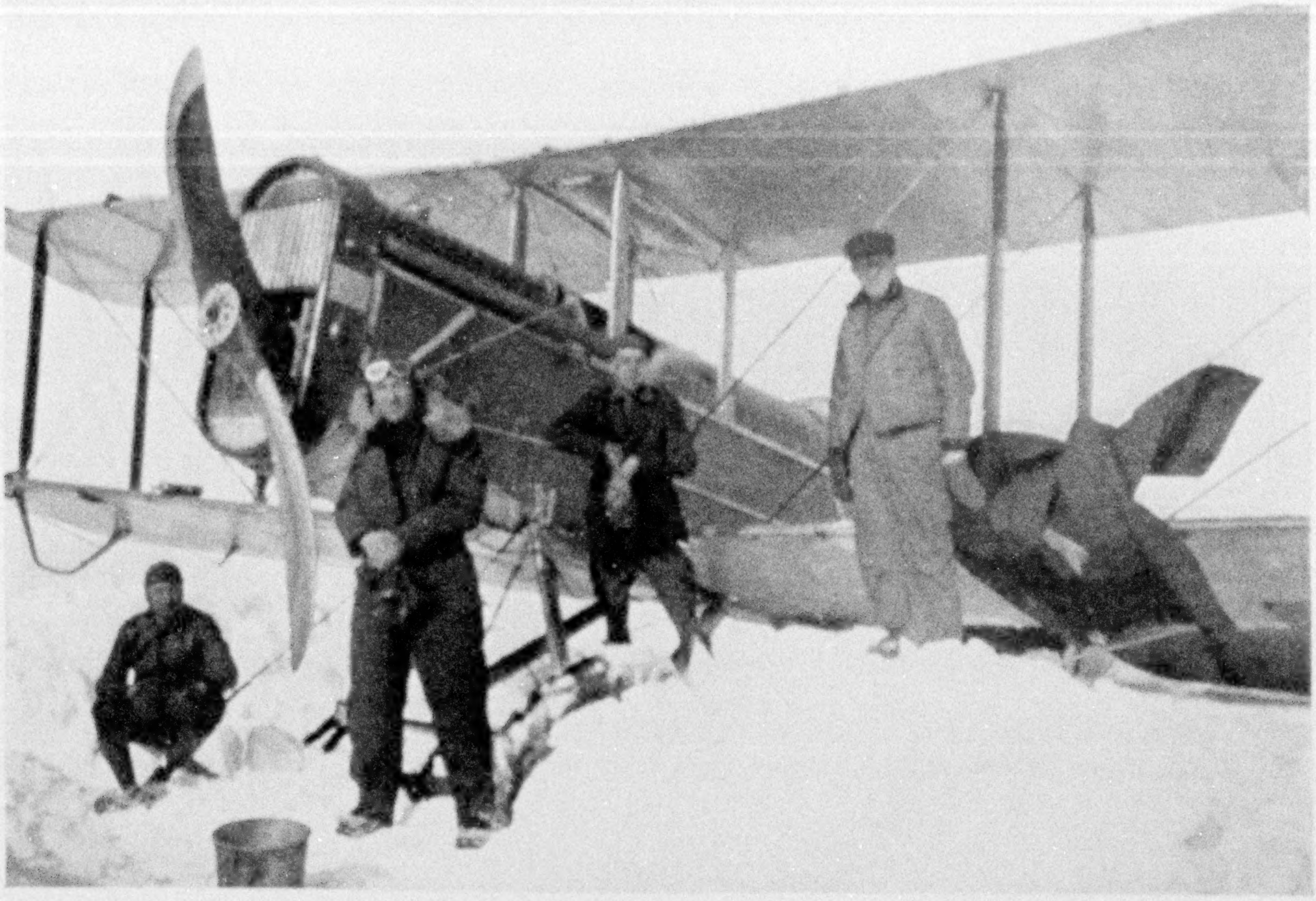
"I reconnoitered around the lake and by great luck discovered a deserted log cabin. A signpost near by read, "Sand Lake—Arlington 14 miles," and pointed along an old hunting trail buried under the snow, that I could see led off down a vague avenue through the pines.

A BEAR PURSUES A WRECKED PILOT

"It took me five and a half hours to cover the first eight miles. Then the snow began to thin out and I made Arlington by 3 o'clock that afternoon.

"Just as I was getting into town a cowboy rode up and said he'd run across my broken path in the snow, as he was riding over from Elk Mountain. Thinking I was in trouble, he had galloped after me, for paralleling my trail for miles he had found the fresh tracks of a mountain bear."

Pete and I both leaned over the side of the fuselage and studied the broad shoulder of Elk Mountain, where the rocky,



Photograph from Lieutenant J. Parker Van Zandt

THIS PLANE LANDED ON TOP OF TABLE MOUNTAIN, WYOMING, IN SEVERAL FEET OF SNOW—BUT THE MAIL GOT THROUGH (SEE TEXT, PAGE 44)

snow-streaked gashes run down into Medicine Bow meadows. Far below, along a threadlike shelf, three diminutive horsemen cantered into view, dropping from sight as the trail led down into a gulch, to reappear suddenly on the opposite bank.

Perhaps one of them had sighted us fleeting along in the clear sky a mile above him, and was recounting to his comrades how one winter he had "rescued an airman that was bein' chased by a b'ar."

In another fifteen minutes Medicine Bow Range was behind us and the upper waters of the North Platte unrolled before our platform. What appeared like a jumble of toothpicks lay strewn for miles in the water, drifted in reckless confusion against the sandbars or slipping in huddled masses around endless curves under the shadow of high sandy cliffs. These were railroad ties out of Saratoga, floating down to Fort Fred Steele.

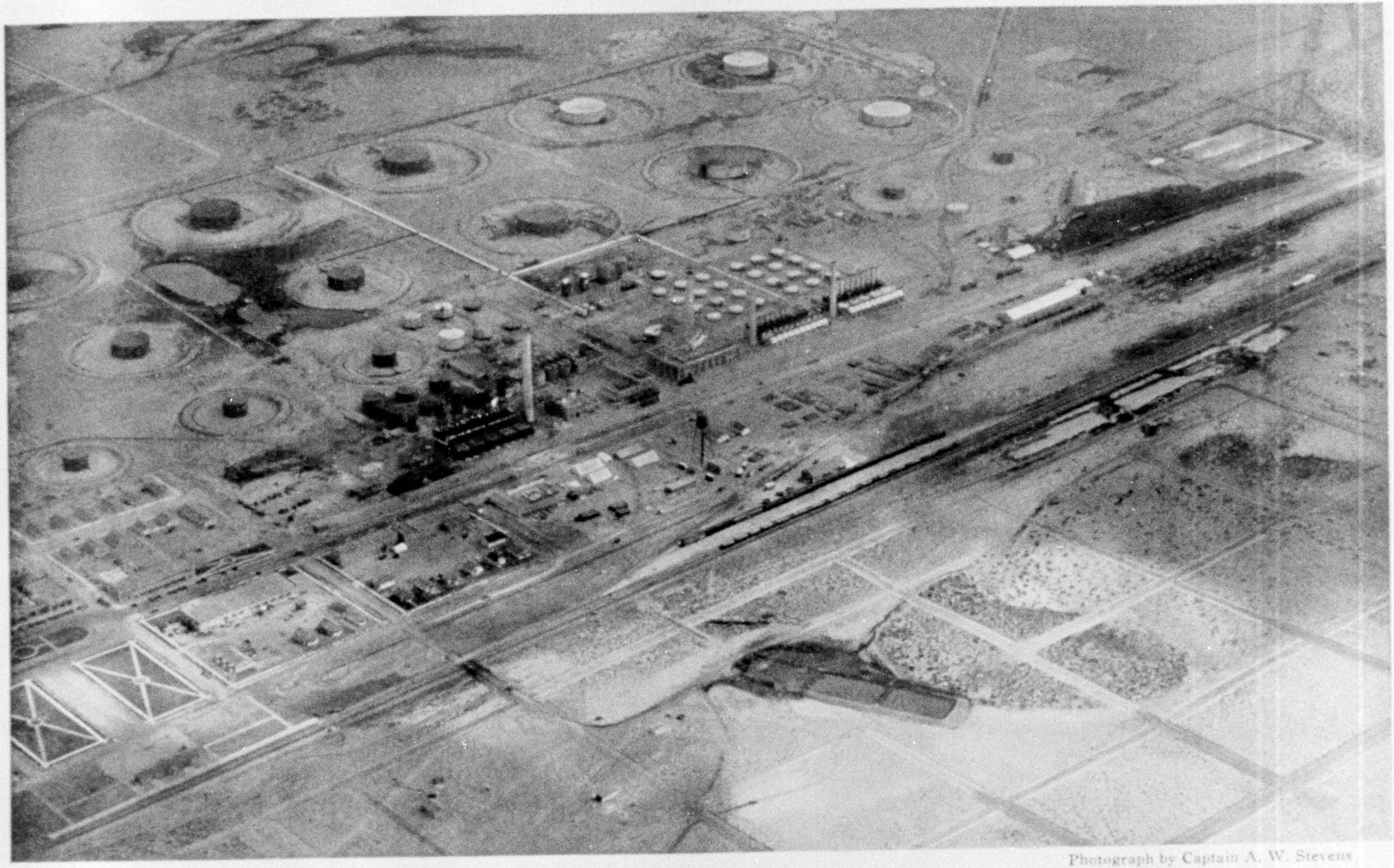
Dropping from our high altitude, we cut across great sloping rows of upended rock strata that looked like successive battlements of some ancient gigantic fortress. Ahead rose the smoke of Parco, a "tailor-made" oil town by the Union Pacific tracks.

And as we descended, the sharp, wavy contour of the Seminoe and Ferris mountains rose up along the northern sky, like the vertebræ of some enormous dinosaur. What a perfect natural playground for the primeval beasts that have left their bones imbedded in such profusion throughout this land!

"Gee whillikins!" exclaimed Pete, throwing a leg over the side of the fuselage, when we had landed at Rawlins one hour and 28 minutes after leaving Cheyenne. "I braked on the U. P. for six months through here, but I never guessed that the country looked like *that!* All them lakes, and mountains, and snows, why, it—it just made my blood tingle all over!"

Rawlins is the highest Air Mail Service station on the entire transcontinental route, 6,745 feet above sea-level. It is also probably the poorest, as regards terrain, and we were thankful the next morning to get off without wrapping a wing around the little hangar.

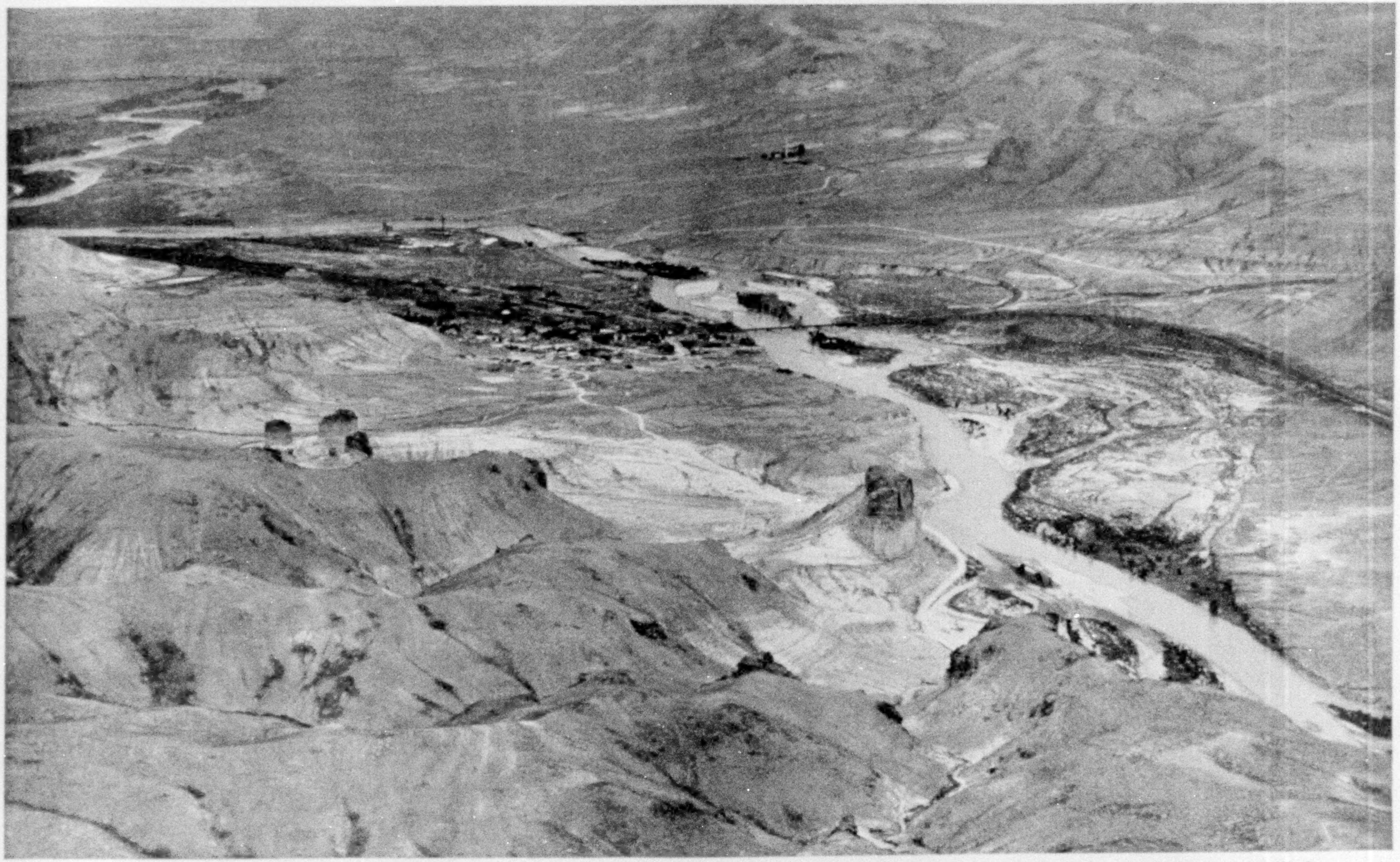
The saving feature that makes night-flying possible in and out of this field is



Photograph by Captain A. W. Stevens

LOOKING DOWN UPON PARCO, TEN MILES EAST OF RAWLINS, WYOMING

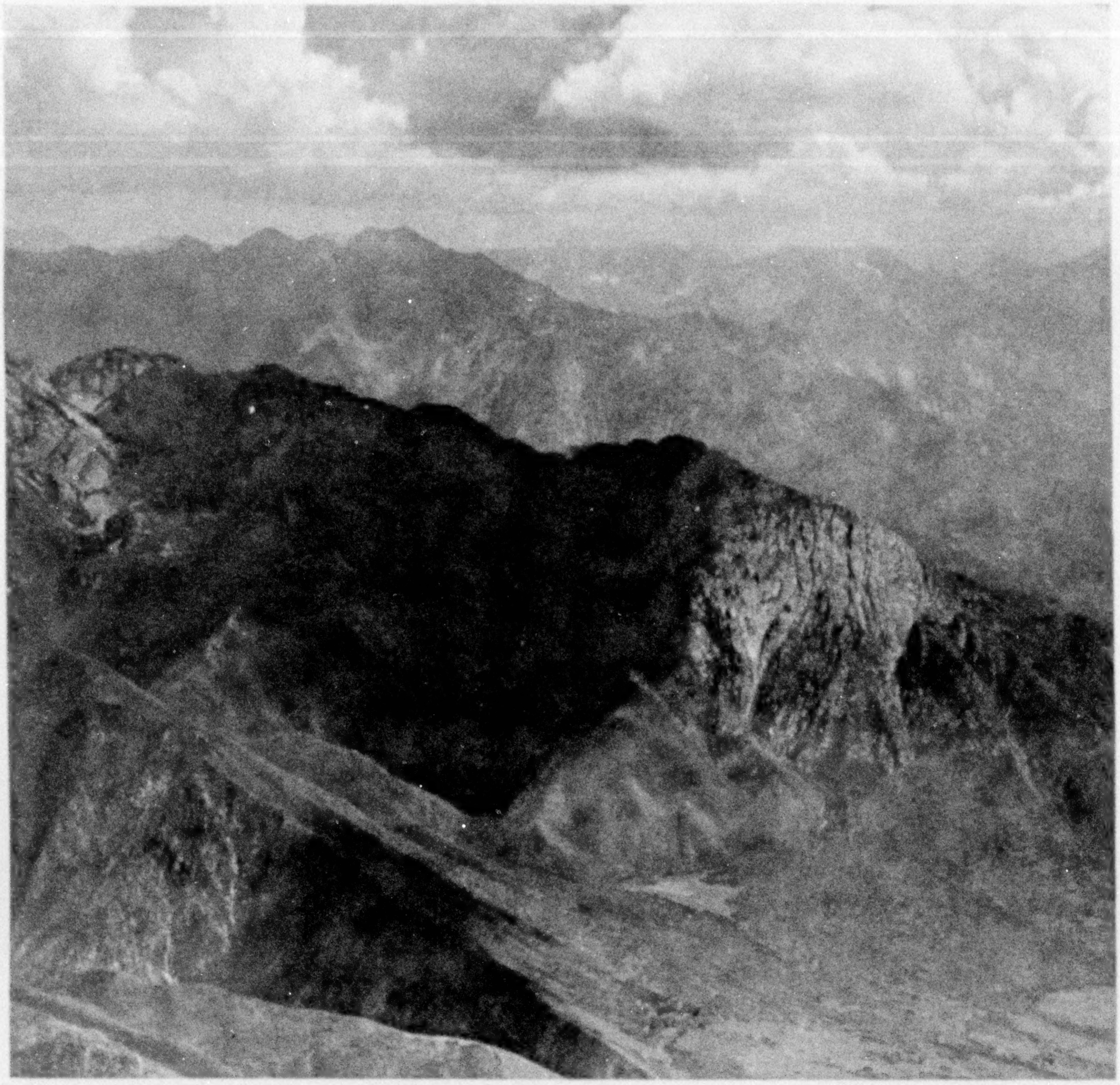
The route of the Air Mail runs almost directly over the large oil-treating plant shown in this aërial photograph (see, also, text, page 35).



Photograph by Captain A. W. Stevens

GREEN RIVER, WYOMING, AS THE AIRMAN SEES IT

Mountain water, flowing over green shale, assumes the light to deep shades of green which give both the river and the town its name. The river bluffs have been carved by the elements into curious forms, such as natural monuments and castlelike structures, light green below and dark brown above. The upper beds, being harder than the lower ones, make protecting caps for the pinnacles. Major J. W. Powell started in 1869 from the little town of Green River for his daring exploration of the Colorado's canyons.



Photograph by Captain A. W. Stevens

LOOKING NORTHWARD FROM ROCK SPRINGS TOWARD SALT LAKE CITY

As the Air Mail pilot approaches Salt Lake City the mountains attain great height and present a rather terrifying aspect. In fair weather it is possible to go over the peaks and under the clouds shown in this photograph, but on days when the clouds hang on the mountain tops or descend into the valleys between, the Air Mail pilot takes desperate chances, for he may become trapped by clouds in these yawning canyons, which are so narrow that it is often impossible to turn and go back. Usually the state of the weather is determined at several points along the line and the flights are delayed a few hours when conditions are so dangerous for flying across the mountains that death is not unlikely.

the almost unfailing presence of a strong westerly wind. Indeed, out in Red Desert, toward which we were now headed, it is said that the cow-punchers and even the sheep and cattle grow up leaning toward the west; and if the wind were to cease blowing, they would all fall on their faces!

As we saw no signs of life in the desert, save one skulking coyote loping through the scattered sage across the red sand, I cannot personally vouch for this statement.

Pilot Collison might shed some light on it, however, for he threw off a propeller blade here one morning near dawn last July, and landed by degrees for a mile or more, tossing away first one propeller blade, then the radiator, then a hasty assortment of cylinders, and finally coming down himself with the remainder of the plane.

This accident grieved his heart. Although he had not even blown a tire getting down in the scrubby sagebrush, it

Photograph by Captain A. W. Stevens

SALT LAKE CITY, WITH THE CAPITOL BUILDING IN THE DISTANCE

In the left foreground is the Tabernacle, with its circus-tentlike roof, the Mormon Temple and grounds. To the right is the Hotel Utah.

was the first time in eighteen 'dead-stick' landings that he had broken a wing-skid.

"Propellers are my hoodoo," he told me. "Two years ago, near Elk Mountain, I was flying into a forty-mile wind, tossing around in the bumps like a cork in the wake of a steamer. All at once the ship started losing speed and I heard a shrill, piercing sound.

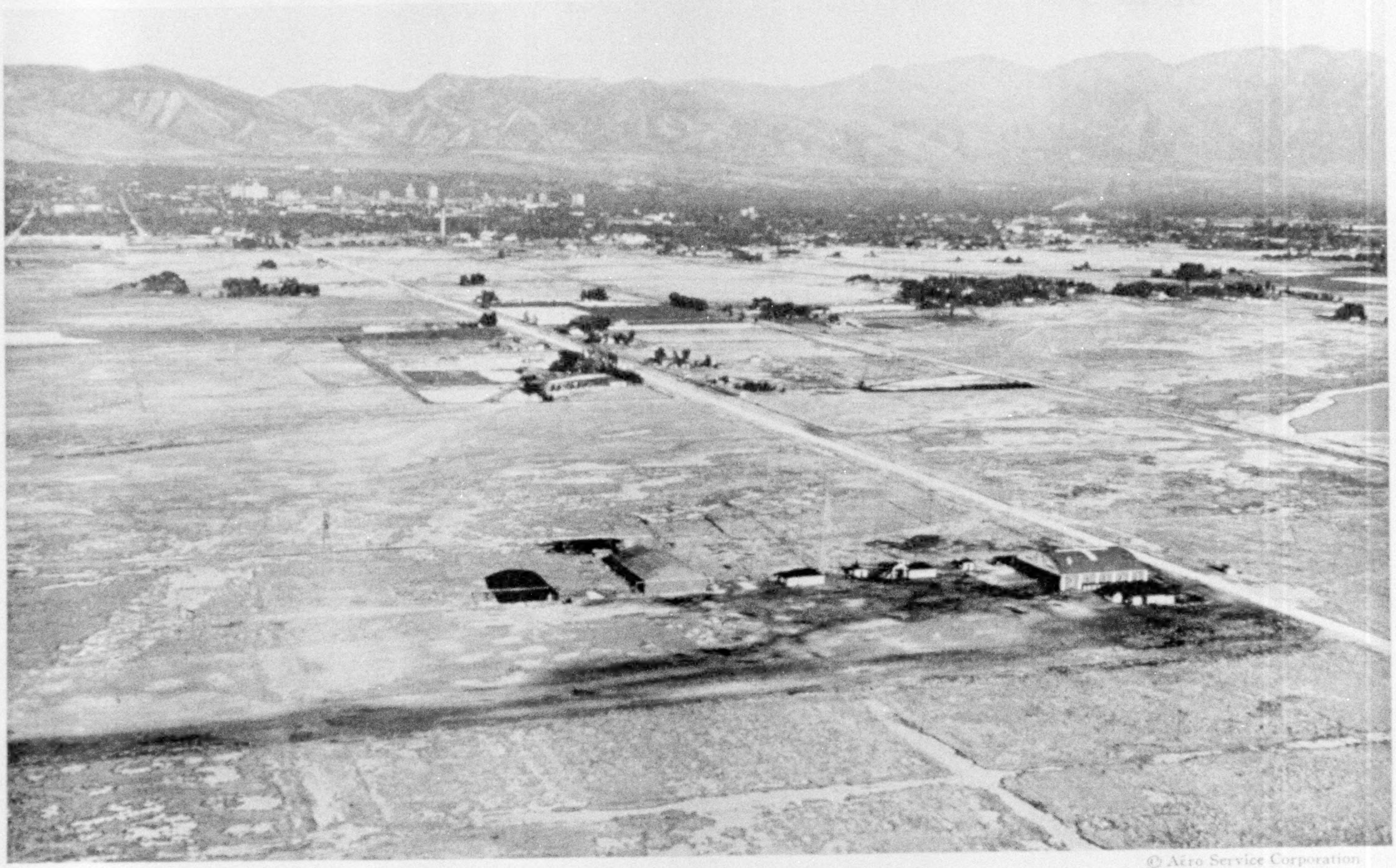
"Cutting the switches, I made a forced landing on Mike Quealy's ranch, threw out a couple of mail sacks to block the wheels, so the plane wouldn't run away, and started an examination to find what was wrong. You can imagine my surprise when I suddenly noticed that the propeller was completely missing!

"That was number thirteen dead-stick landing," he added mournfully.

EACH AIR MAIL SECTION HAS ITS "HARD-LUCK" PILOTS

Every section of the transcontinental route has its "hard-luck" pilot. At Omaha, on the Central Division, two nights before, a grease-monkey had remarked: "Lange's turn out to-night. It's sure to rain." On this section Collison clearly qualifies for the dubious honor, while on the Pacific Division Scott holds the "title."

But there are other pilots whom trouble rarely visits. Among them is Bob Ellis, who has flown for six years, over 200,000 miles, with only one dead-stick landing,



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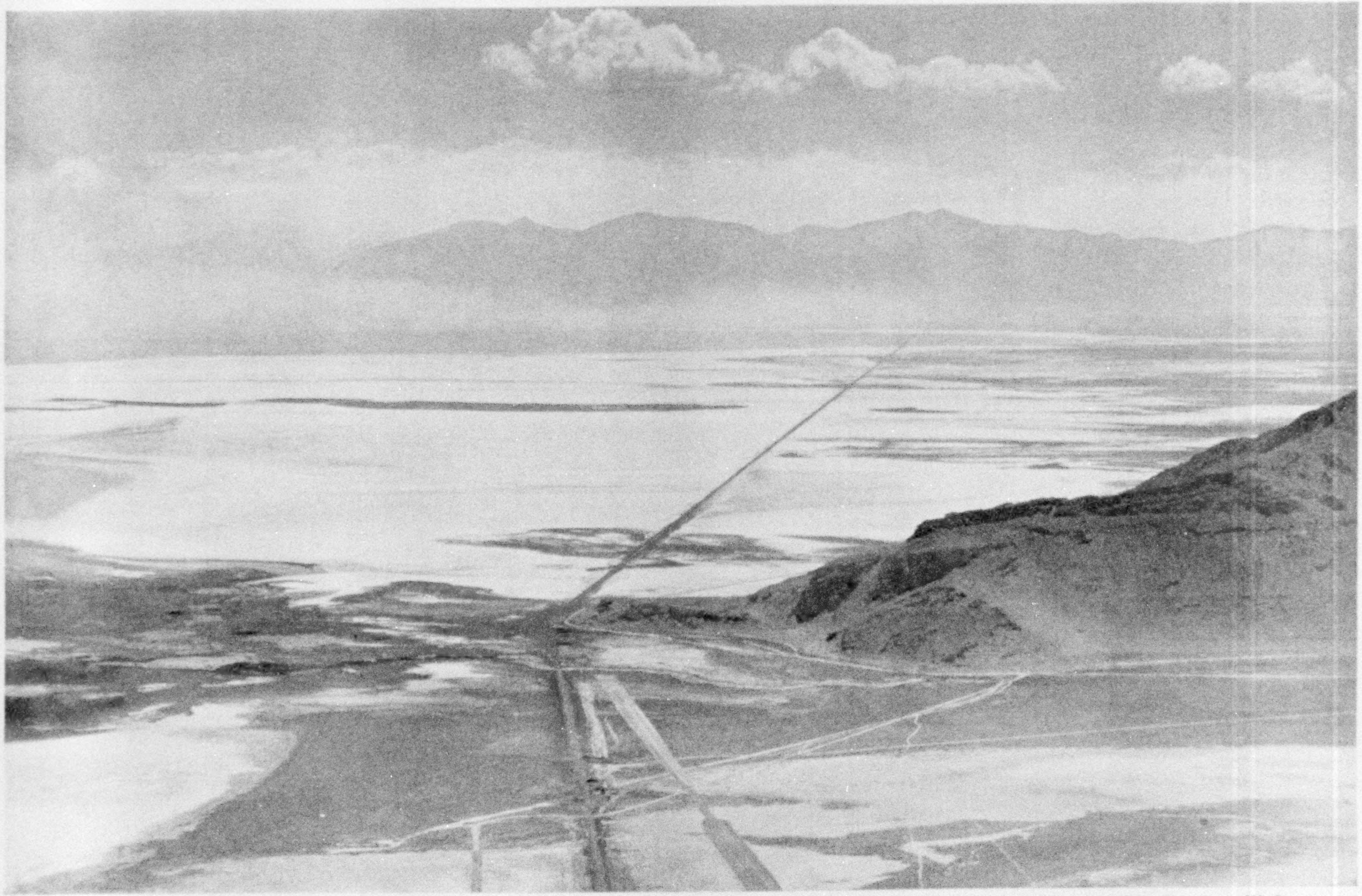
THE SALT LAKE CITY AIR MAIL FIELD

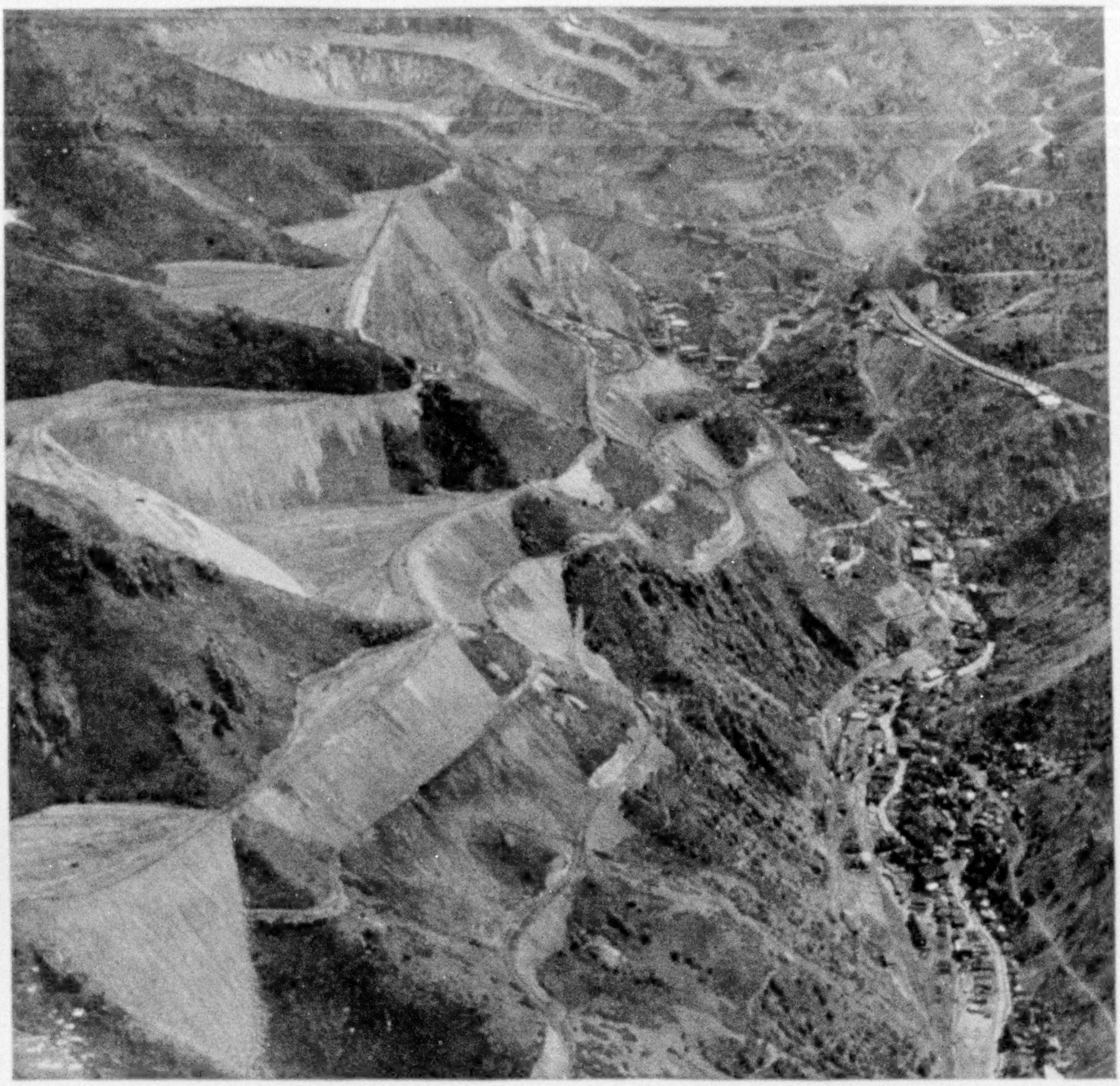
This landing field is located two or three miles west of the city and some four or five miles south of the Great Salt Lake. The dark strip in the foreground is the long cinder runway used for landing and taking off. The hangar at the left is used by the Army Air Service Reserves.



Photograph by Captain A. W. Stevens

THE LUCIN CUT-OFF, ACROSS GREAT SALT LAKE, AS SEEN FROM THE AIR

This epoch-making event in railroad construction was completed in 1903, at a cost of $10,000,000. It shortened the main-line route between Ogden and San Francisco by 44 miles, eliminated 3,919 degrees of curvature, and reduced the total grade by 1,515 feet. Originally the trestle was 27.5 miles long, but eight miles were replaced by a fill. In the depth of winter, large masses of Glauber's salt (sodium sulphate) are to be seen along the embankments and trestle.



Photograph by Captain A. W. Stevens

LOOKING DOWN UPON BINGHAM, UTAH, "THE WORLD'S NARROWEST TOWN"

The copper camp mining community is situated in the bottom of a canyon which is less than 50 feet wide. The town is two miles long and consists of two rows of houses. The street is so narrow that the residents can sit on their front porches and shake hands with passing motorists.

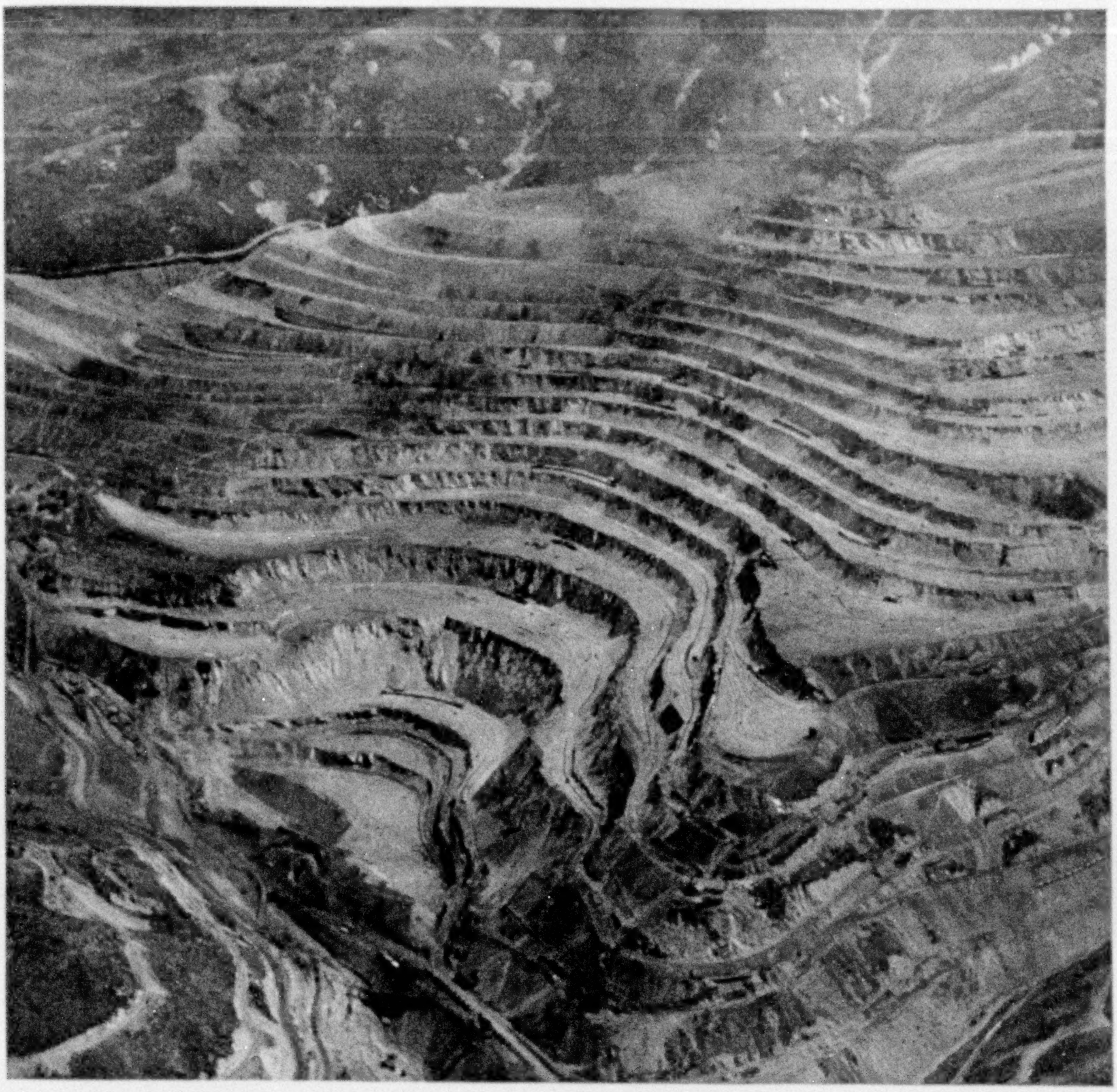
and that was four years ago. Whatever the luck, however, flying never loses its fascination. Like a cup of refreshing coffee, it's good to the last drop.

Red Desert now lay behind us and Table Rock rose up sheer and scorched on our left. Beyond, the solitary smoke of a locomotive floated out of Bitter Creek canyon, the only evidence of life in the whole treeless waste.

A COLLISION WITH A TOURIST'S AUTOMOBILE IS NARROWLY AVERTED

Advancing crabwise along the course, in the grip of the strong wind, the welcome sight of an emergency field beacon tower rose above the sage; then the Lincoln Highway, a reddish vein through the dust-white earth.

Since one sagebrush appeared quite as soft as the next, we dropped down until the wheels of the plane almost stirred up the dust on the road, taking heart from the increased speed with which the landscape flew by. Here and there in the ditch, under the mottled sage, lay the bleached bones of cattle. It was somewhere on this highway that Collison had made one of his famous dead-stick landings.



Photograph by Captain A. W. Stevens

ANOTHER VIEW OF THE COPPER MINE OPERATIONS AT BINGHAM, UTAH (SEE, ALSO, ILLUSTRATION ON OPPOSITE PAGE)

I grew bored after a time with the constant vigil of the wheel tracks streaking ahead through the deep dust and turned my head for an instant to scan the hillside for coyotes. At that precise moment a stalled automobile loomed up dead in our path and we narrowly averted a collision.

The alarmed owner came wriggling out in frantic haste from under the car, covered from head to foot with dust; three or four small heads shot out from behind the camping equipment with which the car was piled, and the wife, in regulation tourist breeches and veil, made a flying dive for the back seat to extract an overworked camera.

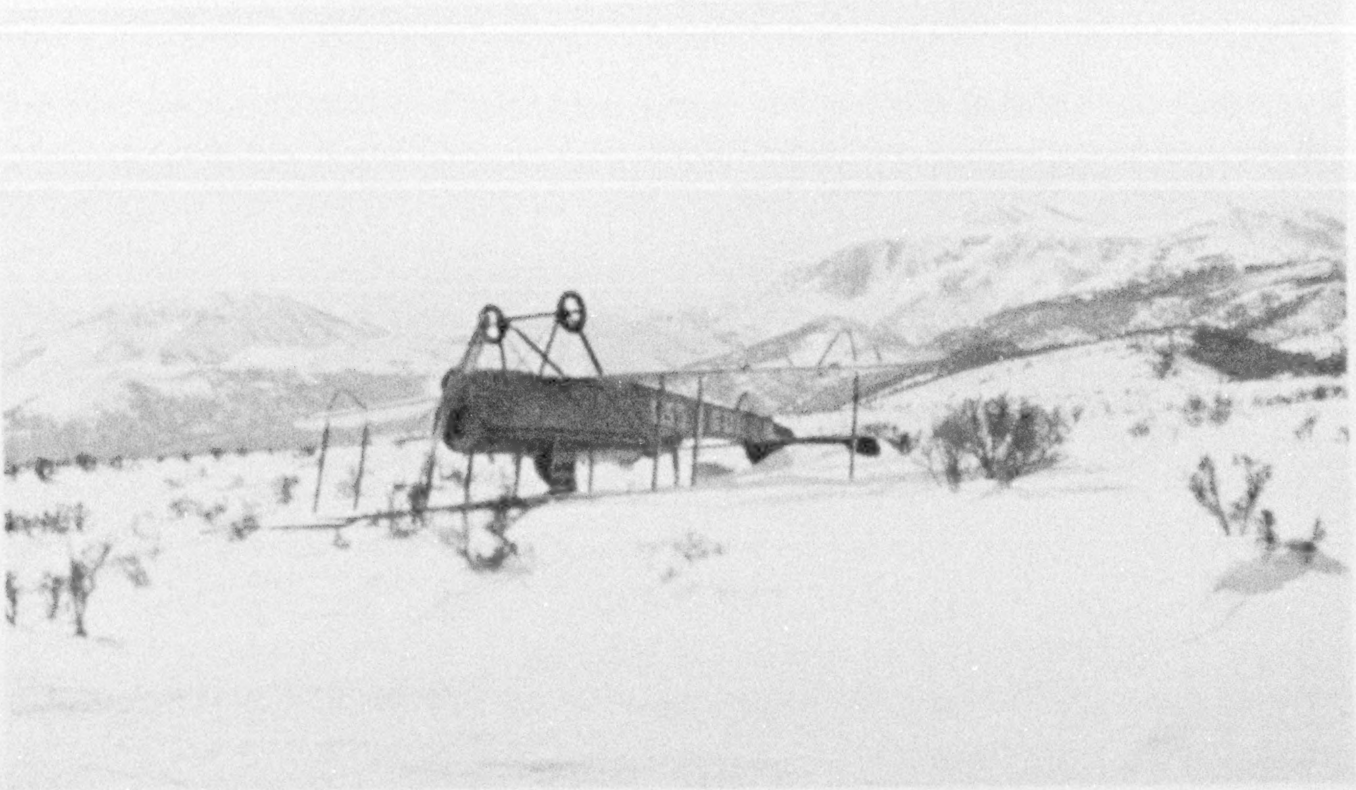
But we were gone over the brow of the hill, swinging gaily along toward Point of Rocks.

A deep gash in the desert floor opened below, revealing the Union Pacific tracks; then the dry bed of an ancient lake, forming a perfect landing field, with a beacon marker planted in its center.

Above the raked and blistered Aspen Mountains on our left, a tiny speck flashed in the colorless sunlight and came floating by on outspread wings. It was a great bald eagle, emblem of America.

WHERE FRONTIERSMEN "PITCHED STATES LIKE TENTS"

It is incredible the distance one can see in this high, clear air. The whole length



Photograph Courtesy U. S. Post Office Department

A FORCED LANDING DURING A WINTER STORM ON THE SNOW-COVERED SLOPES OF MOUNT ROSE, NEAR RENO, NEVADA (SEE, ALSO, ILLUSTRATION, PAGE 46)

of the Continental Divide seemed to be embraced in the almost limitless outlook. Butte after butte and range upon range rose out of the plateau floor.

I could have sworn we could make out South Pass, 50 miles to the north, along the Sweetwater, once the fur trader's gateway to the Northwest; and, rising up faintly beyond, the foothills of the Wind River Range, where the wary trappers had set their beaver traps, in constant peril from marauding bands of Crows and Blackfeet.

Across these wide, sterile steppes and through the gloomy mountain defiles, those hardy frontiersmen of a century ago had pursued their adventurous enterprise, pitching new States "as Old World men pitch tents." But it is only within 35 years that an unbroken chain of American commonwealths has stretched across the continent, ending at last the westward drive begun at Jamestown and Plymouth Rock.

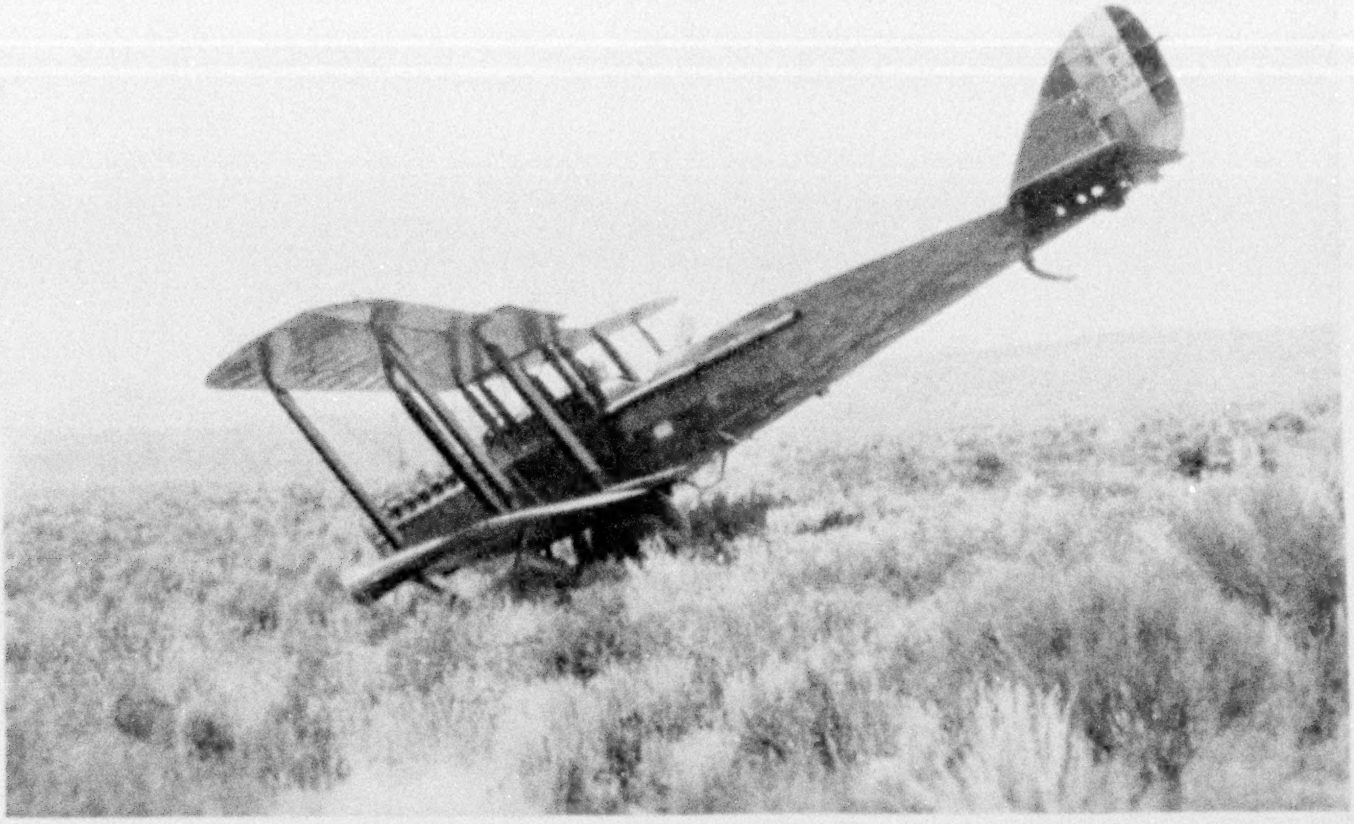
Ahead, the smooth, flat top of Table Mountain spread across our path, a familiar landmark to the mail pilot. On its broad back, one winter, Chandler had landed in several feet of snow; and against its precipitous side Ellis had once been sucked into a snowdrift, caught in the treacherous down-drafts of wind that pour over the ledge. There, perforce, the plane had remained, for the rest of the winter, planted in the 70-degree snow-slope, while the pilot and mail were salvaged by means of a rope let down from above (see illustration, page 35).

From the level summit rises a solitary Pilot Butte, and at its base, by dry Killpecker Creek, lies the Rock Springs Mail Field.

As we glided in for a landing, a playful gust of wind lifted one wing and canted us over almost fifty degrees, then righted us suddenly again.

This was a catastrophe to Pete, for it scattered among the sagebrush the store of chocolate bars which he had carefully laid by, against future want, on a shelf in the cockpit. He had already learned that nothing improves scenery like a little refreshment.

The hangar crew was engaged in moving a concrete block which housed the gasoline pump. A few years ago it had been buried flush with the gravelly soil; but the tireless winds had whipped and tugged about it until now it stood, a needless hazard, two feet above the surface of the field. We did not stay to offer our assistance, but hurriedly fed our thirsty mount with water, gasoline, and oil and took off for Salt Lake.



Photograph from Lieutenant J. Parker Van Zandt

THE AUTHOR TRIES DITCH-JUMPING NEAR ELKO, NEVADA

"A shallow, unmarked ditch lay hidden under the June grass at one end of the field and into it we rolled, breaking the undercarriage" (see text, page 59).

Photograph by Peter Berger

INDIANS OF MINDEN, NEVADA, VISIT THE AIRMAN AUTHOR AND HIS PASSENGER

Photograph by Frank E. Caldwell

ON THE AVIATION FIELD AT RENO, NEVADA

This is the last scheduled stop for the Air Mail in its flight to San Francisco.

At the base of Table Mountain, Bitter Creek leads westward between tinted columns of sandstone pinnacles to Green River. The fertile headwaters of this "Colorado of the West" were once the favorite spring rendezvous for the rival British and American fur companies.

A mail plane on an errand of mercy visited those headwaters two winters ago, speeding a doctor to Pinedale, where a dying man lay snow-bound on the slopes of the Wind River Range.

Leaving Green River, the Union Pacific swings northward, hugging the valley of Blacks Creek, while we struck boldly west across the most desolate and inhospitable section of any we had thus far seen.

For 40 miles the course lay above a country that God had seemingly forgotten. Even the hardy sagebrush could not endure such a cheerless home.

Ugly, waterless gulches wandered lost in the cracked and cauterized earth, and the whole bleak, lifeless landscape simmered in the fires of an unconsoling sun. The last outpost of civilization seemed to have receded beyond recall, while we hung like a suspended speck, an ineffectual wavering thunder, at the heart of an oppressive mystery.

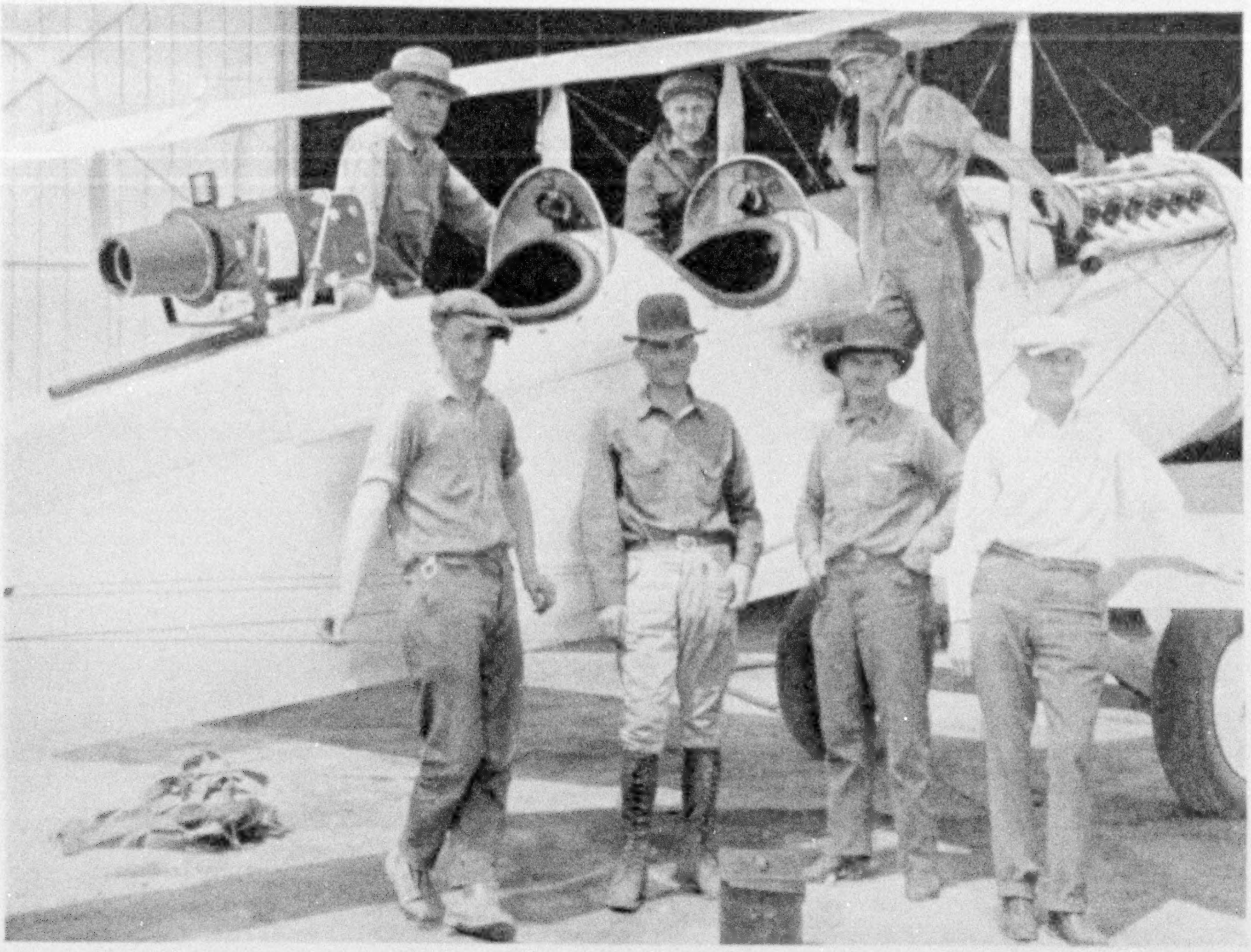
WATCHFUL HANGAR CREWS READY TO RUSH TO AID OF PILOTS

Yet, for the Mail pilot, the curse has been largely lifted from this forsaken land. He knows that his progress is being closely timed by the watchful hangar crews, advised by radio of his departure from the last Air Mail field. Within an hour or more, should he be forced down by weather or motor trouble, anxious teammates will be scouring the countryside to find him and bring him aid.

On Granger's Bench, a broad ledge creeping slowly toward us, Lester Bishop once had occasion to test the warmth of this fraternal bond.

A sudden snowstorm had swept over the benchland, out of the Uinta Mountains massed to the south.

Blinded by the swirling sheets of snow, Bishop had been forced at last to "sit down"; but he kept his engine idling, hoping the visibility would improve. Within



Photograph by Captain A. W. Stevens

AIR MECHANICS, WESTERN STYLE, GATHERED ROUND THE PHOTOGRAPH PLANE AT ELKO, NEVADA

Winter temperatures as low as —40° have occurred here, but the Air Mail mechanics have kept the planes in flying condition, working in an unheated hangar. Almost all of the hangars on the transcontinental route are now equipped with heating systems.

three hours his isolated bench-top was covered with a three-foot blanket of wet snow (see illustration, page 29).

Impossible to take off now. He shut off the engine, drained the fast-cooling water from the radiator, and started on foot for Lyman, 20 miles away, plunging waist-deep with each step in the fresh snow.

When too far to retrace his steps, he realized with growing dismay that his failing energy was unequal to the distance yet remaining. Still he struggled on, fighting off the almost overpowering temptation to sink down in the soft covering and rest.

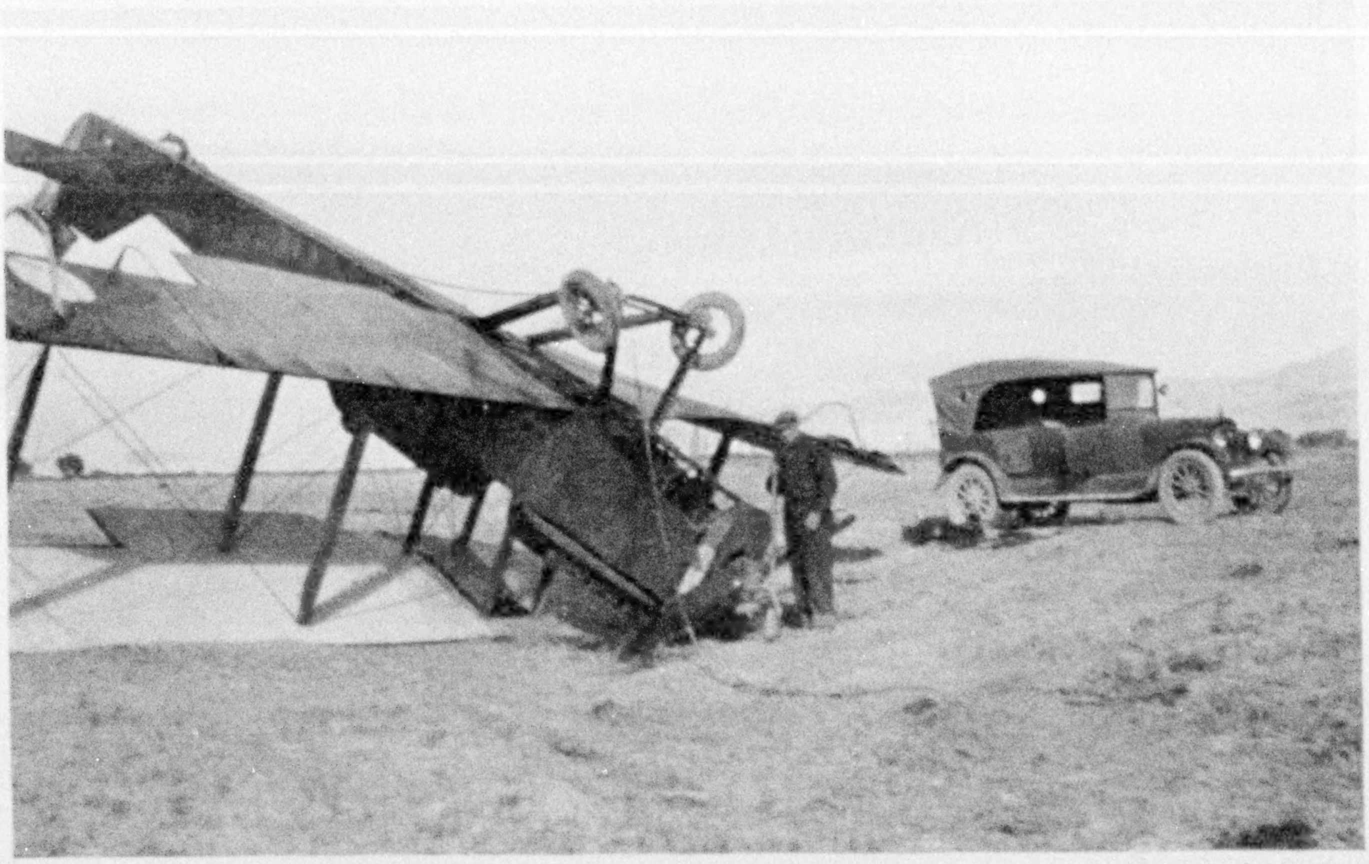
TESTING THE FRATERNAL BOND OF THE AIR MAIL

At the limit of his strength he was roused by the unmistakable tone of a Liberty engine and, looking up, saw a mail plane bearing down upon him. Bob Ellis had located his empty plane and after age-long minutes of anxious searching had sighted the tiny black figure half buried in the deep snow.

An hour later Bishop was at the Rock Springs field, carried back in the mail pit of Ellis's plane, which had succeeded in landing on a windswept ridge near by.

Beyond the seared cliffs of the benchland the marshy meadows of Fort Bridger and Lyman shine out like an oasis of green. They are fed by eternal springs in the Uintas, whose snowy crowns stretch for 80 miles along the southern horizon, a wondrous silver arrow in the blue quiver of the sky, pointing the Mail pilot's course.

Small wonder that the canny Scout Bridger, who knew the West as few men of his day, selected this favored garden spot in which to establish his fort. Among those cottonwoods and willows once rose the smoke of a thousand emigrant camps,



Photograph by Frank E. Caldwell

WHEN A MAIL PLANE IS DOWN, THE HANGAR CREW'S TURN BEGINS

The mechanics in the Mail Service are remarkably efficient and devoted and often perform tasks of great hardships and difficulty under extremely trying conditions, without the encouragement of public acclaim which is usually accorded to the Mail pilot.

and friend had eagerly questioned friend, "Are ye for Oregon or Californy?"

Past Bridger's Butte, whose oval top appeared as level as a ballroom floor, our course led by an old railroad bed, once the main line of the Union Pacific, but now abandoned for a shorter, tunneled route.

The silver pointer along our left closed in and the massive, rounded dome of Porcupine Ridge rose frowning on our right, with beautiful Chalk Creek canyon at its base.

THE MOUNTAIN FAIRYLAND OF THE WASATCH RANGE

For 60 miles, into Salt Lake across the Wasatch Range, there opened up a mountain fairyland that set my heart on edge, with memories of starry nights within the forest cathedrals of the Sierra slopes, on sweet beds of fir beside a crackling pine-cone fire.

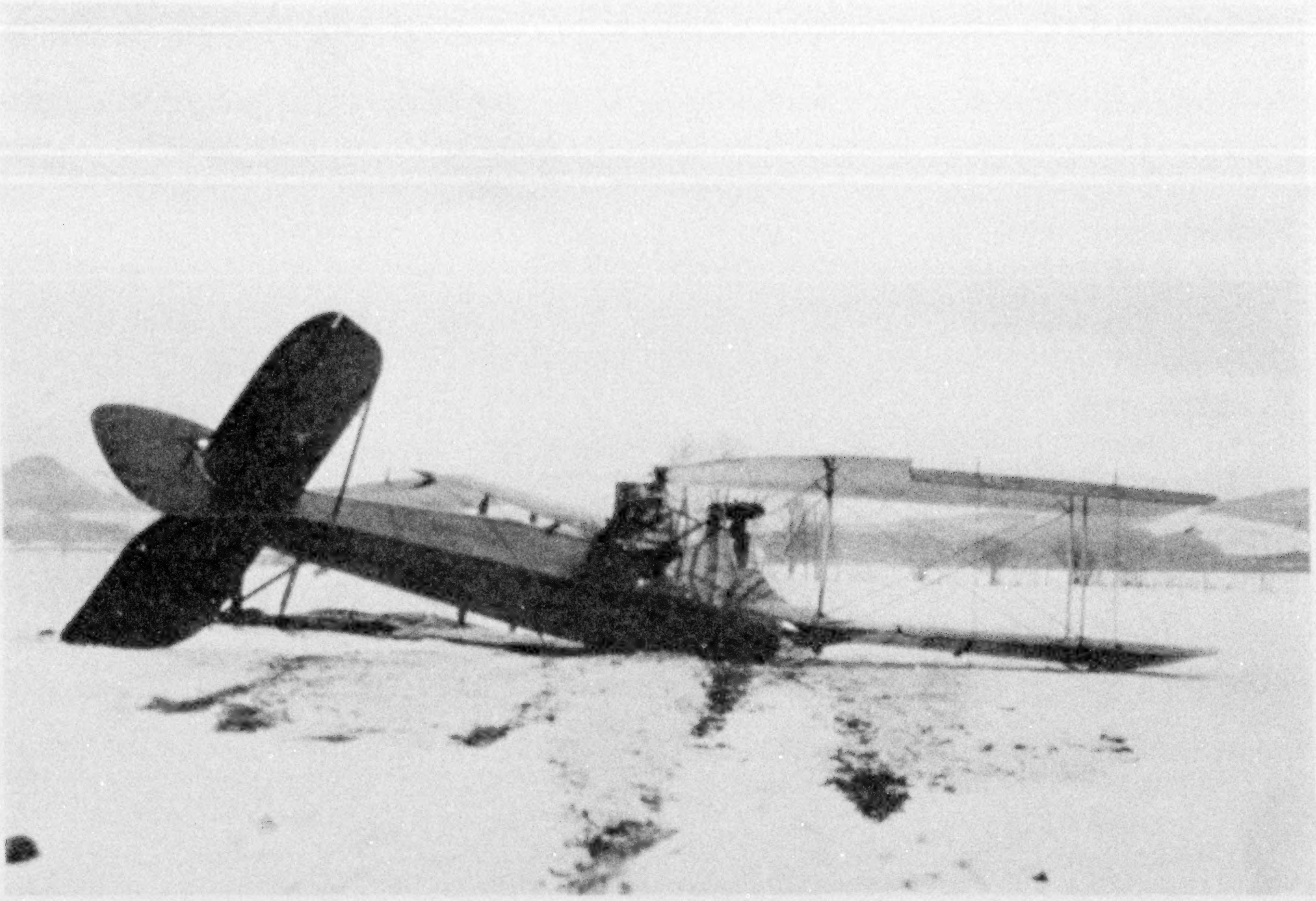
To Pilot Boonstra, however, the sight of Porcupine Ridge kindles no such warming memories.

Here, on an almost inaccessible ledge, at 9,400 feet, he crashed one stormy December morning. For 36 hours he struggled down through the snow, at length creeping on hands and knees to the nearest ranch house, while a mocking magpie kept pace, waiting with easy faith for him to succumb, and a dozen planes searched vainly through the maze of snow-locked canyons.

From our high perch we could look down into Echo Creek canyon, 15 miles to the north, a colored cleft in the mountains; then El Canyon Creek, half girdling the forested base of Lewis Peak and winding off between towering hills toward Devil's Slide.

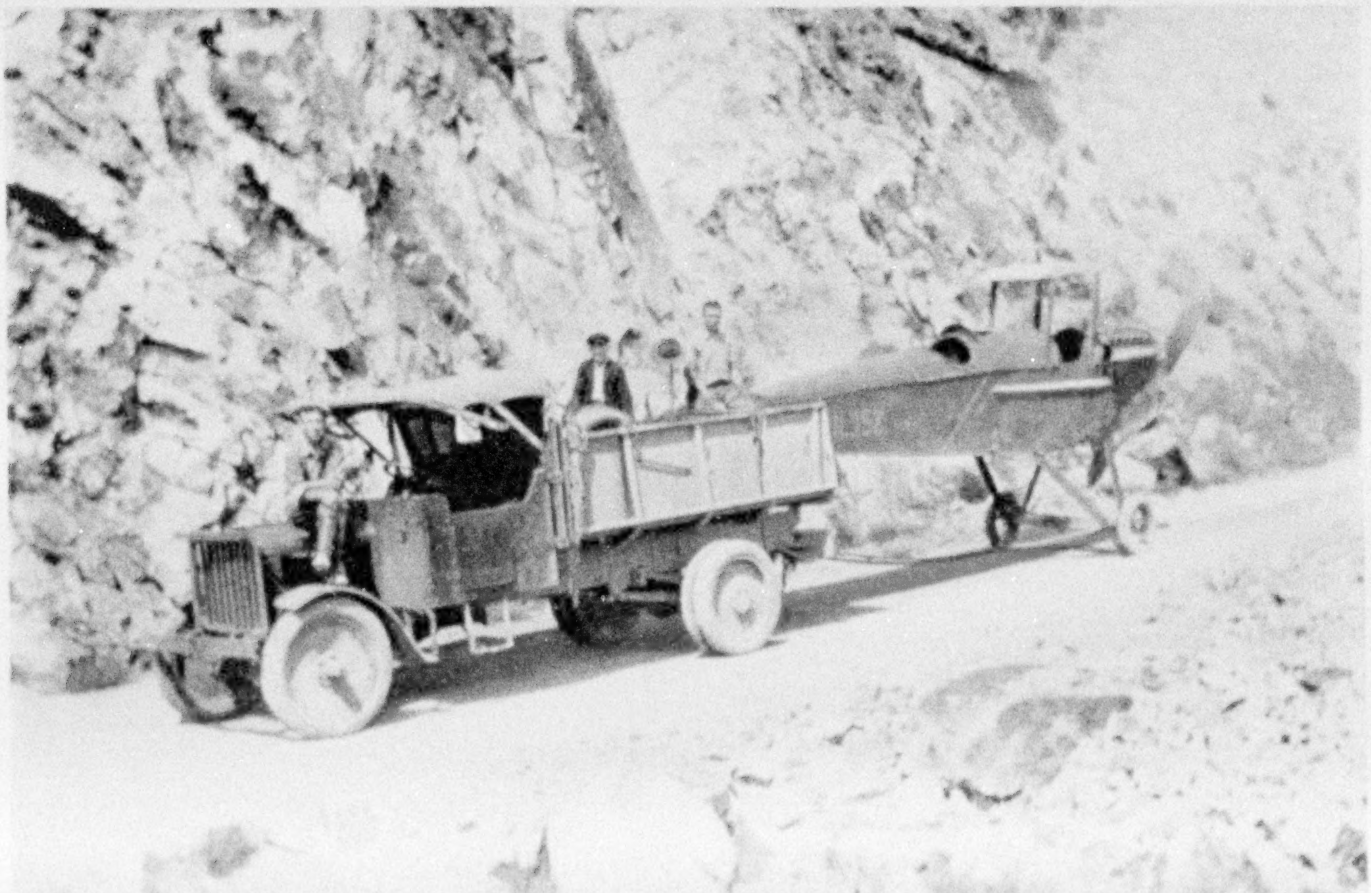
A low saddle appeared in the Wasatch Range, marking the head of Emigration Canyon, the last stubborn obstacle in the path of the Mormon migration. As we swept over the ridge, the glorious panorama of the Great Salt Lake Basin burst into full view, while far below lay Salt Lake City, as if set in a silver-chased cup.

We eagerly sought the Air Mail field and did not wait to count the stockings on the clotheslines, as Artemus Ward is believed to have done in estimating the size of Brigham Young's household.



A CRASH NEAR RENO, NEVADA

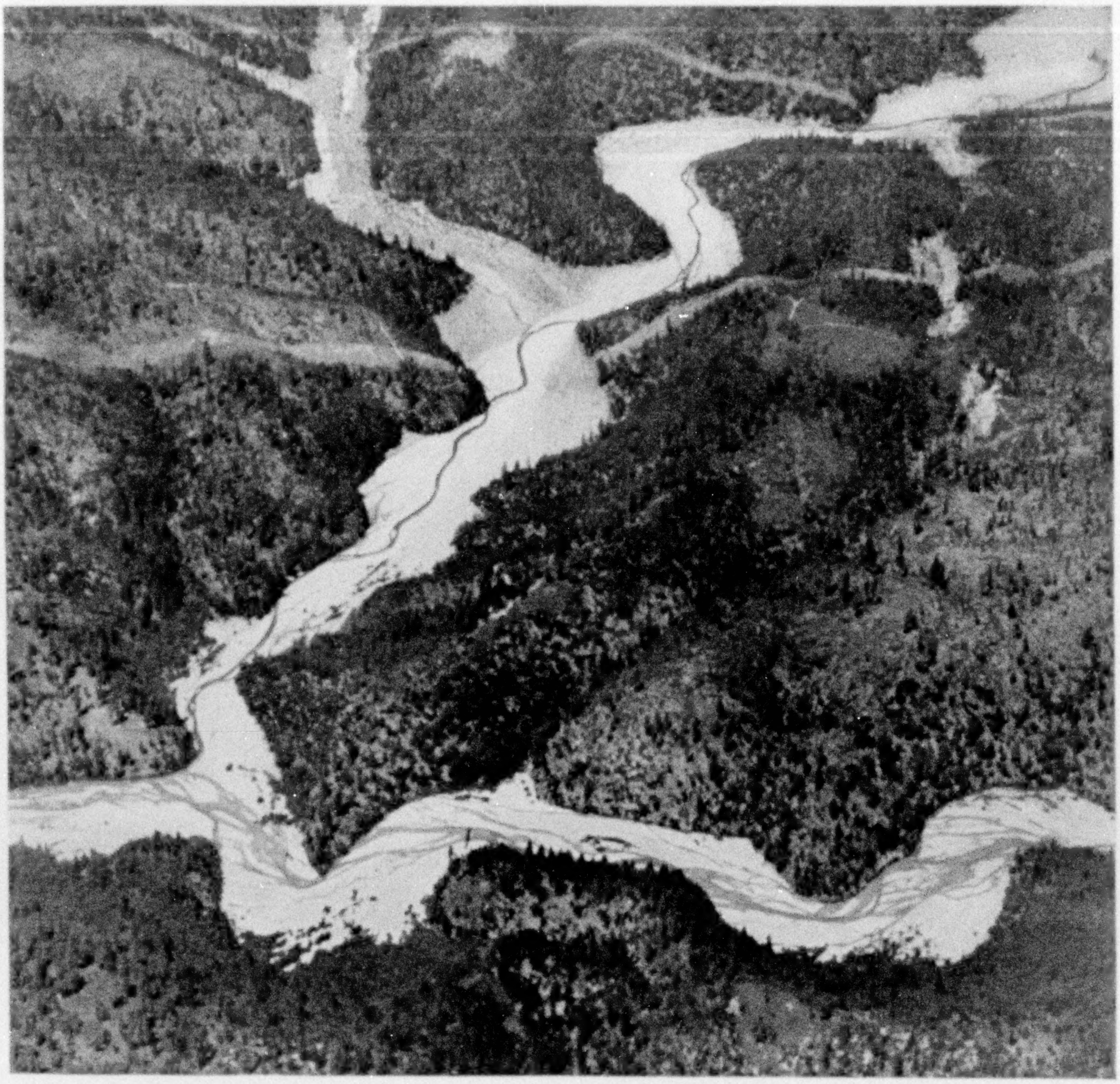
Caught with a missing motor in dense clouds in Truckee Canyon, the pilot scraped over a mountain range, breaking the propeller on the tips of the pine trees, but managed to glide to within 12 miles of Reno. The plane was wrecked on landing, but pilot and mail were unharmed.



Photographs by Frank E. Caldwell

HAULING IN A CRIPPLED FLYER

This Mail plane made a successful landing in 12 feet of snow high up in the Sierras, on a frozen lake too small to permit a successful take-off.



Photograph by Captain A. W. Stevens

GOLD MINERS HAVE LEFT THEIR TELLTALE TRACES IN THESE WHITE SANDS

In California, the "Forty-niners" located rich gold workings on the east slopes of the Sierra Nevada. For many years the débris and tailings from these mines were dumped without restriction into the nearest stream bed. To-day, under present laws, mining operations must be conducted so that the tailings are impounded. Here we see two mountain creeks at their junction, pursuing a snakelike course through the bed of sand which has resulted from the placer workings farther up the mountain sides.

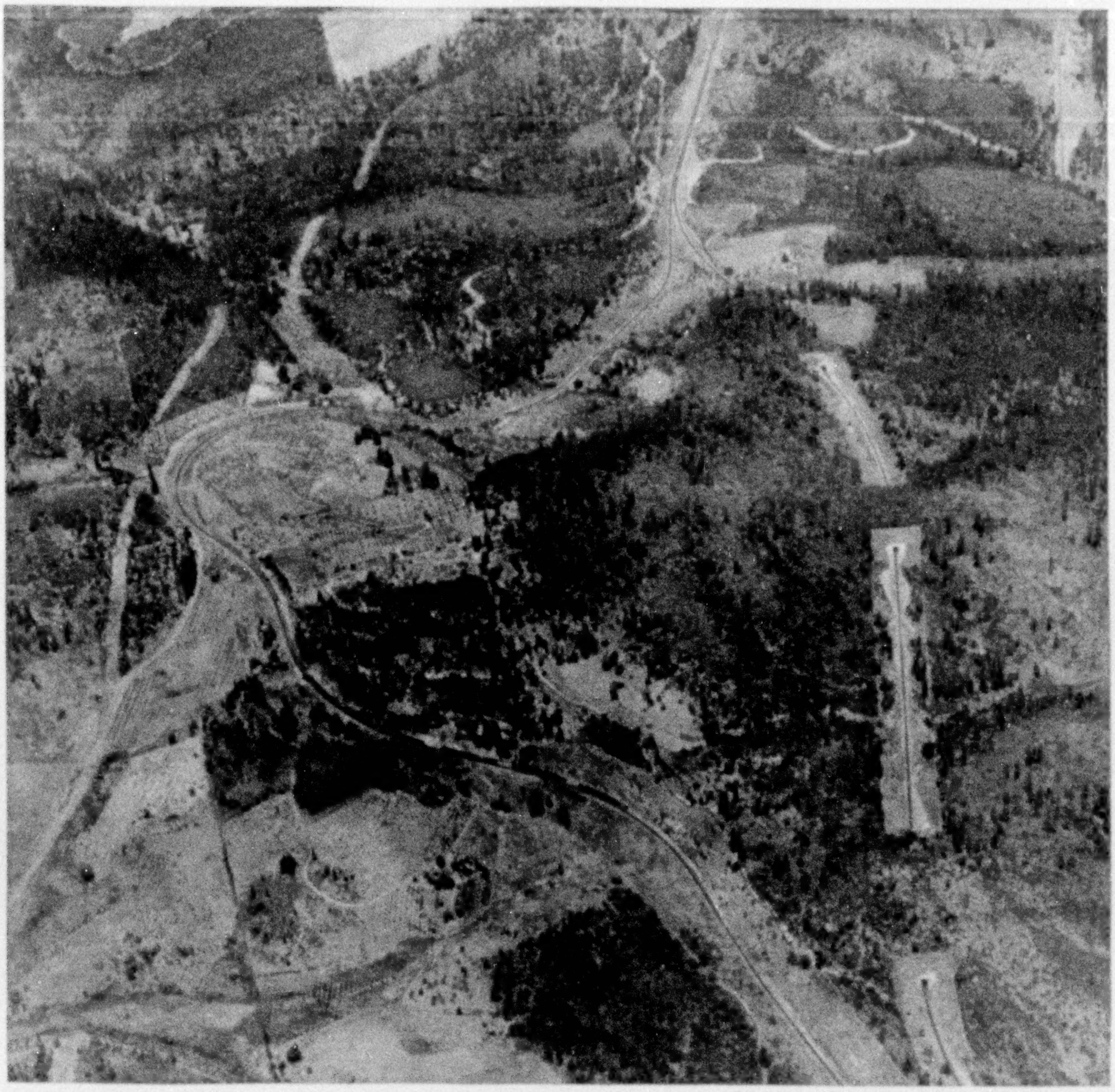
Our goal now seemed just over the horizon. To be sure, a trifling 600 air-miles still lay before us; but they shrank into insignificance as we thought of the more than 2,000 miles that stretched away to the east.

THE AIR MAIL, BORN IN 1918, BEGAN LIFE IGNOMINIOUSLY

The unimpeded progress of our happy pilgrimage and the novel sights of the Mormon capital thrilled Pete and went to his head like wine. He grew loquacious, and from him I learned much of interest beyond what I already knew about the early days in the Mail.

The year 1918 now seems like the Pliocene Age, as the history of aviation goes; yet it was in May of that year that the Air Mail was born. The President of the United States, then Woodrow Wilson, with several members of his staff, went to the polo field in Potomac Park, Washington, to witness the first plane take-off.

An escort of Army aircraft lined the inclosure. The moment for departure



Photograph by Captain A. W. Stevens

THE DOUBLE-TRACK SYSTEM OF THE SOUTHERN PACIFIC RAILROAD IN THE SIERRA NEVADA

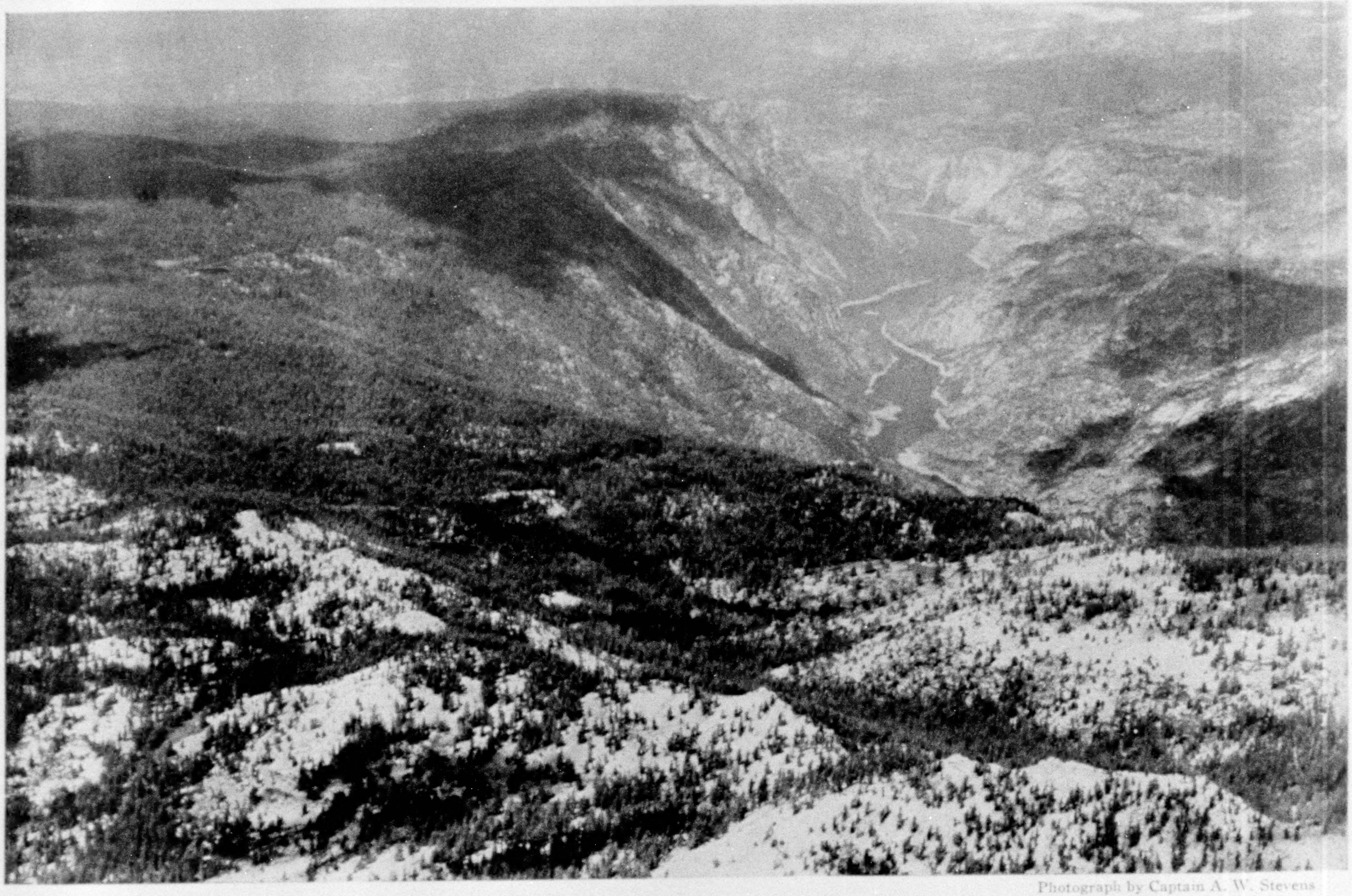
One track cuts through the hills in tunnels, while the other track pursues a more circuitous route, possessing the advantage of easier grades, but involving a longer distance of haul. The photograph covers territory a few miles west of Colfax, California. The railroad line with sharp curves, on the left-hand side of the picture, swinging around Lander Station, is the old Central Pacific, now westbound track. The line showing Tunnels 30, 31, and 32 is the eastbound track. About two miles beyond the top of the picture, in the direction of Reno, is the town of Colfax.

approached and all seemed propitious—when it was discovered that no gasoline had been provided!

In mortification and haste, in the presence of the highest officials of the land, the tank of every aircraft on the field was drained to fill that of the mail ship; and, 16 minutes late, the first Air Mail plane took off for Philadelphia, there to connect with a relay plane for New York. It was destined never to arrive.

The pilot, a young and inexperienced cadet, could not even find Baltimore, only 35 miles away. Completely lost, he attempted to land near a small town to inquire his way. The excited farmers who gathered around his overturned plane informed the would-be courier that he was 25 miles from Washington, in the *opposite* direction from the required route!

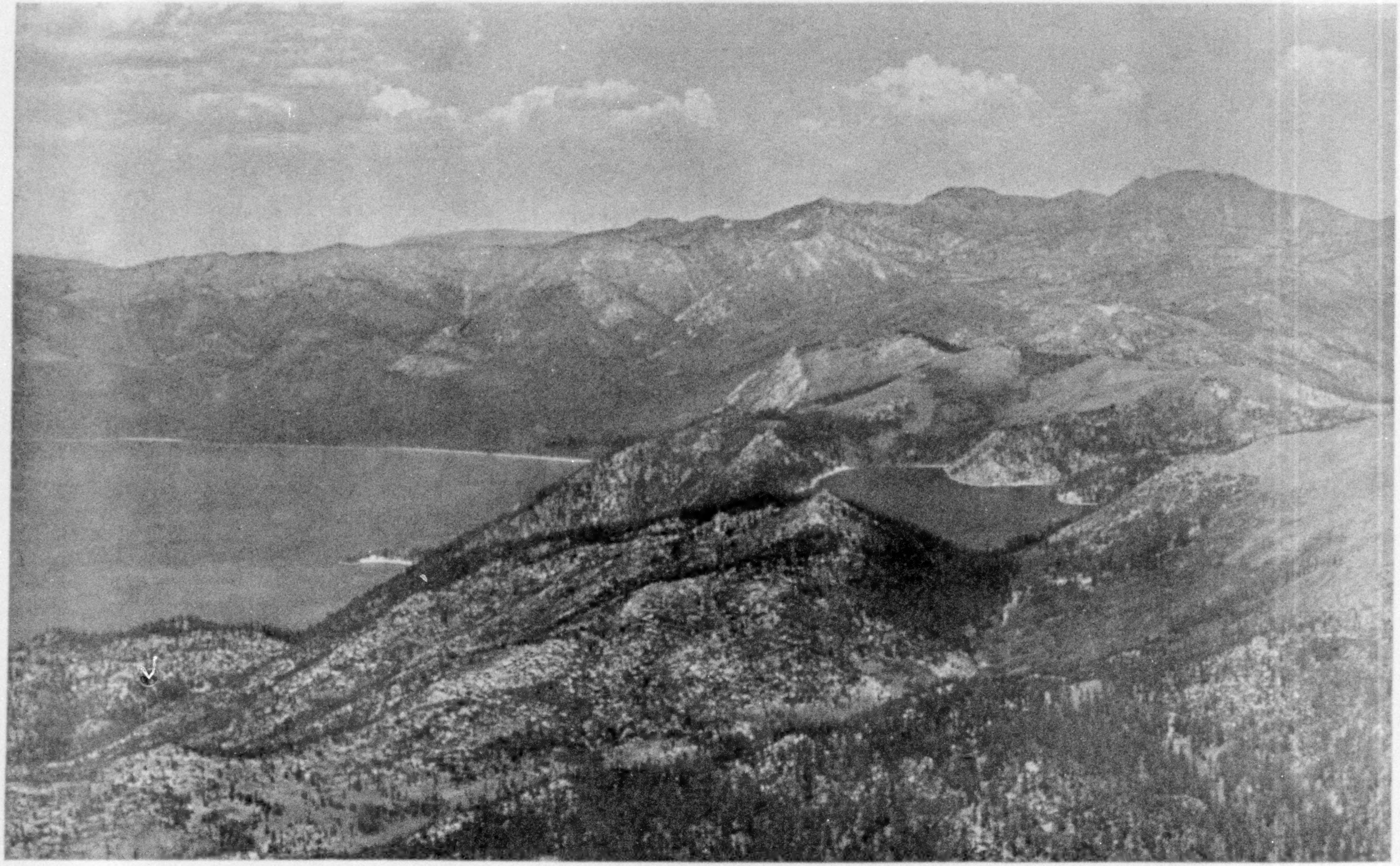
Nor does this complete the tragic tale. The following day the same pilot was given another—and last—chance to follow the elusive air trail to Philadelphia.



Photograph by Captain A. W. Stevens

LOOKING DOWN THE GRAND CANYON OF THE TUOLUMNE RIVER, CALIFORNIA, FROM AN ELEVATION OF 12,000 FEET

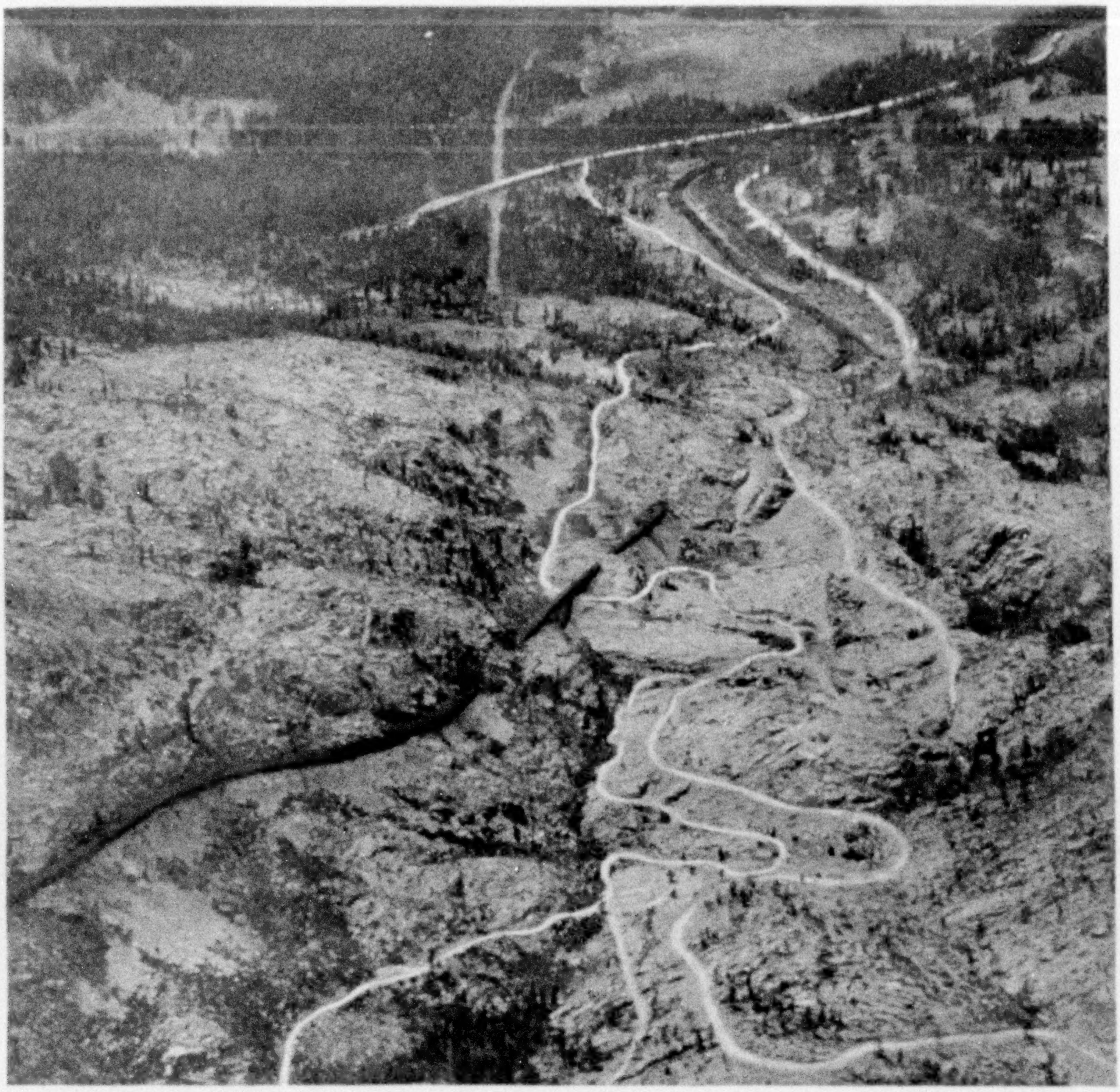
Smith Peak is seen on the left, and to the right of Smith Peak the Hetch Hetchy Valley. Note the water line on the banks, showing how the reservoir has been drawn down during the summer's use.



Photograph by Captain A. W. Stevens

LOOKING NORTH AT LAKE TAHOE

Also note the tiny mountain lake to the right, which apparently has an elevation of some two or three thousand feet higher than Lake Tahoe.



Photograph by Captain A. W. Stevens

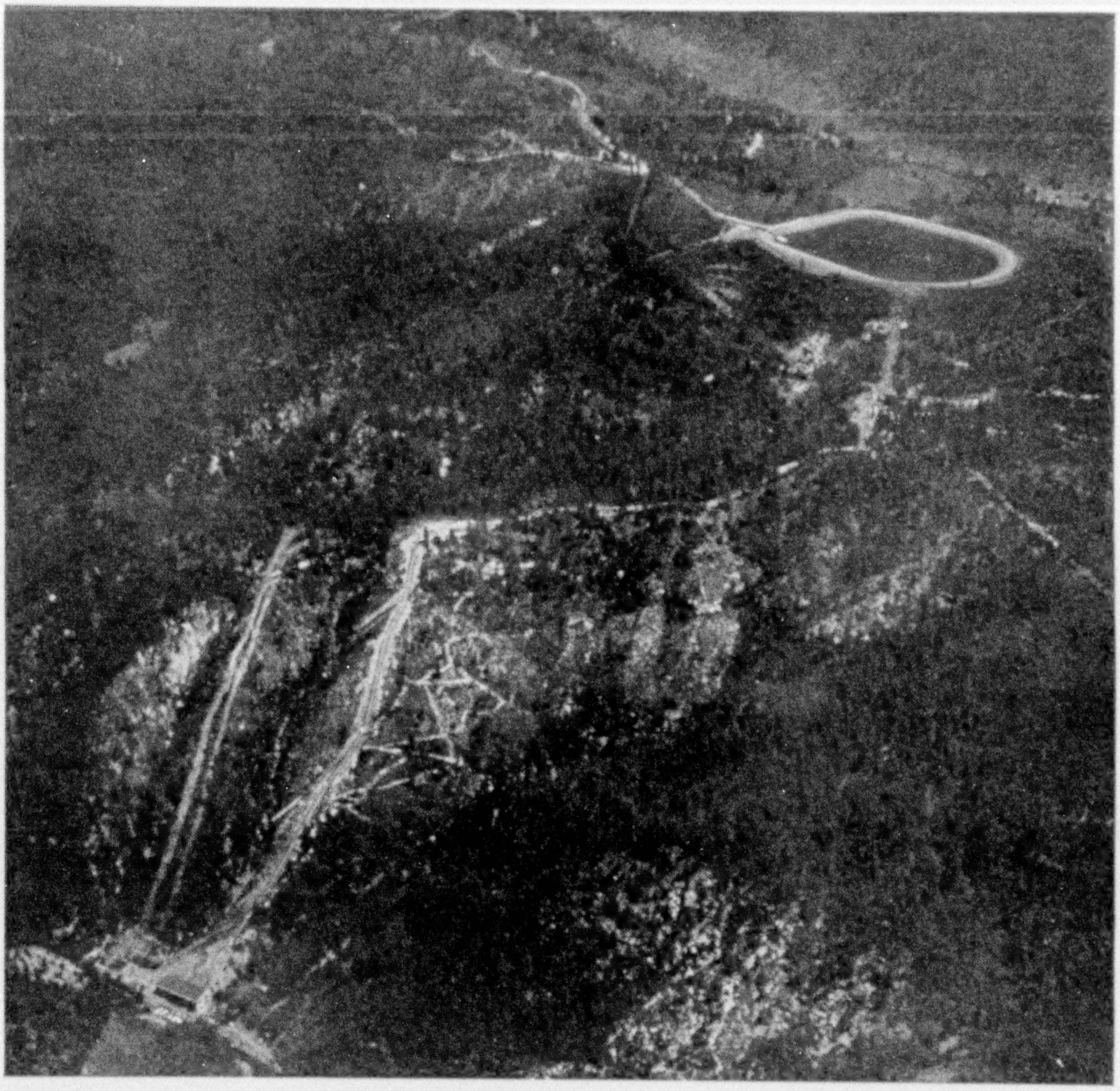
THE SOUTHERN PACIFIC LINE TUNNELING ITS WAY THROUGH THE SIERRA NEVADA

This railroad probably has as much difficulty in crossing the mountains at this point, some 30 miles northeast of Lake Tahoe, as at any point on its whole system. The snow sometimes reaches a depth here of 30 feet, so that it is necessary to inclose the rails with snowsheds, which can be seen beginning at the lower left corner of the picture. Not only is this part of the Sierras difficult for the railroad to cross, but it is also difficult for the automobile road, which may be noted in the center, twisting and turning, as it winds up the sides of the canyon. This photograph covers territory on the exact summit of the Sierra Nevada at the crossing of the Southern Pacific Railroad. Tunnel No. 6 is the Summit Tunnel; Summit Station is to the right of this tunnel. The highway passes under the railroad tracks east of Tunnel 7. In the right foreground is seen the new State highway under construction. The straight white line at the top of the picture is the second track of the Southern Pacific's main line under construction.

He vainly searched the smiling landscape as far as Cape Charles, Virginia, where the Atlantic Ocean and lack of fuel put an end to his explorations with the Mail.

Out of such ignominious beginnings has grown the finest example of dependable air transportation that the world has yet seen, flying over 10,000,000 miles and transporting more than 6,000,000 pounds of mail.

During the tentative period of the first two years neither pilots nor green field crews were quite sure how it would all turn out, while inexperienced executives led them from one false trail to the next and a hostile Congress frowned on the whole impossible undertaking.



Photograph by Captain A. W. Stevens

A CALIFORNIA HIGH HEADWATER POWER DEVELOPMENT

The water from canyons is led from a point miles farther up, by canal, to the relatively small reservoir shown in the upper right corner of the picture. The water then flows from the reservoir through an extremely strong pipe line to the power house shown at the foot of the steep hillside. Here it dumps over the Pelton wheels into the canyon at the power house. Water in some developments is used again for a similar installation immediately below in the same canyon. Frequently several power houses appear on the same stream.

"One of the first studies was to determine whether visibility is absolutely necessary to flying," reads an early Post Office report. And the slogan, "Fly or resign," was popular among those whose duties kept them with both feet on the ground.

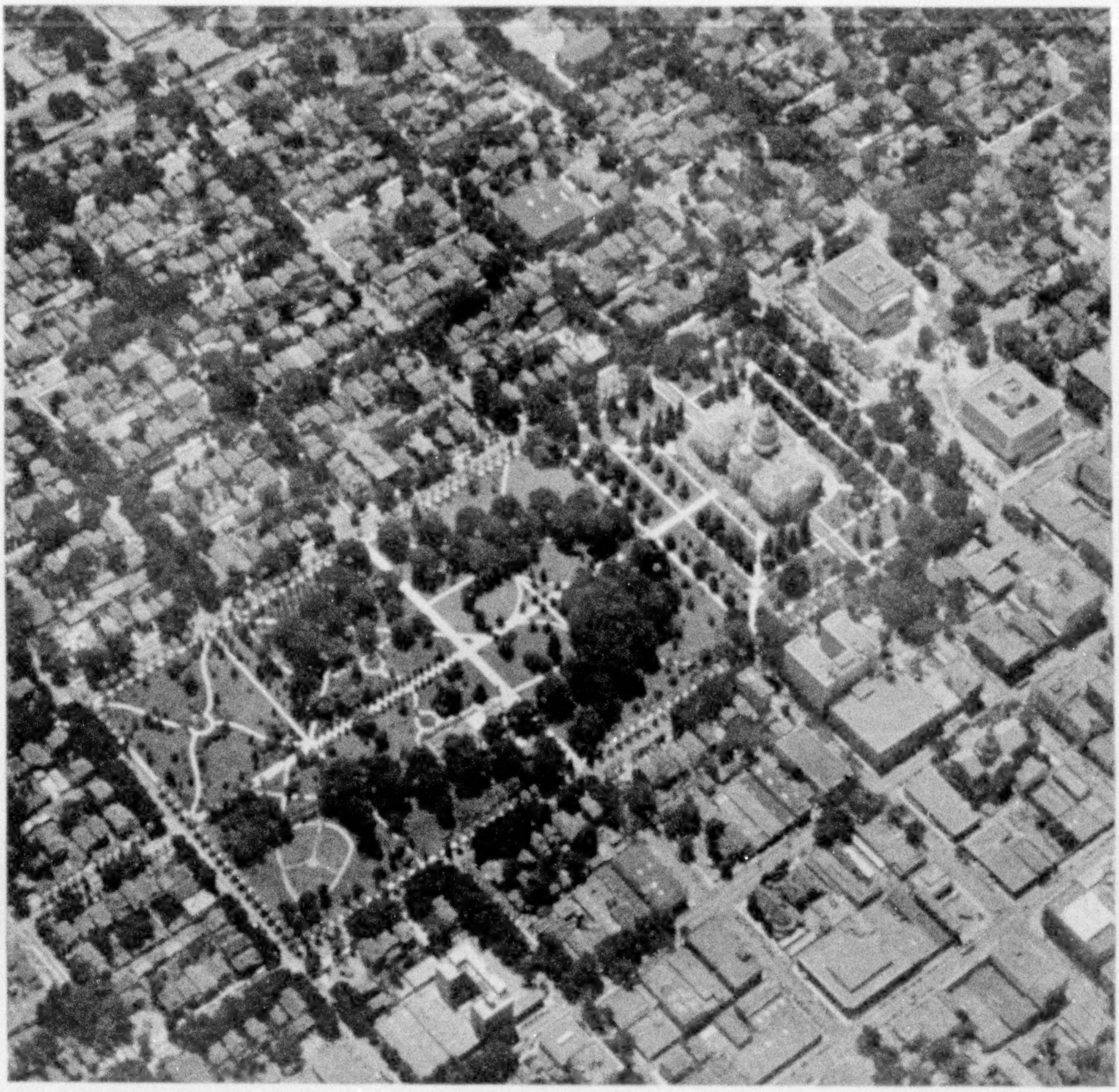
SHORTER LINES ABANDONED FOR TRANSCONTINENTAL ROUTE

During the fateful year of 1920 a number of the finest pilots lost their lives while flying unsafe and obsolete equipment.

Then a new policy came into force. A standard type of plane, equipped with the 400-horsepower Liberty engine, was adopted. The shorter mail lines were abandoned and all effort concentrated on perfecting the service along the transcontinental route.

The improved performance resulting from this policy was nothing less than remarkable. Year by year the efficiency percentage rose and the morale of the service mounted with it.

In July, 1924, a night schedule was established between Chicago and Cheyenne,



Photograph by Captain A. W. Stevens

AN AIR VIEW OF THE STATE CAPITOL AND GROUNDS, SACRAMENTO, CALIFORNIA

Sacramento was formerly visited by the Air Mail pilot as a resort in case a landing could not be made at Crissy Field, San Francisco. Often the airman, upon reaching San Francisco Bay, found that it was impossible to proceed farther because of the low fog which rolls in, especially during the summer months, from the Golden Gate. He had only to fly northeast to Sacramento and land at the U. S. Army Air Service Field, where the mail could be picked up and shipped by truck or train to San Francisco. Because of the distance required for transfer of mail, it became necessary for the Air Mail Service to provide a permanent field nearer San Francisco—at Concord, which is about an hour's run from Oakland (see, also, illustration, page 58).

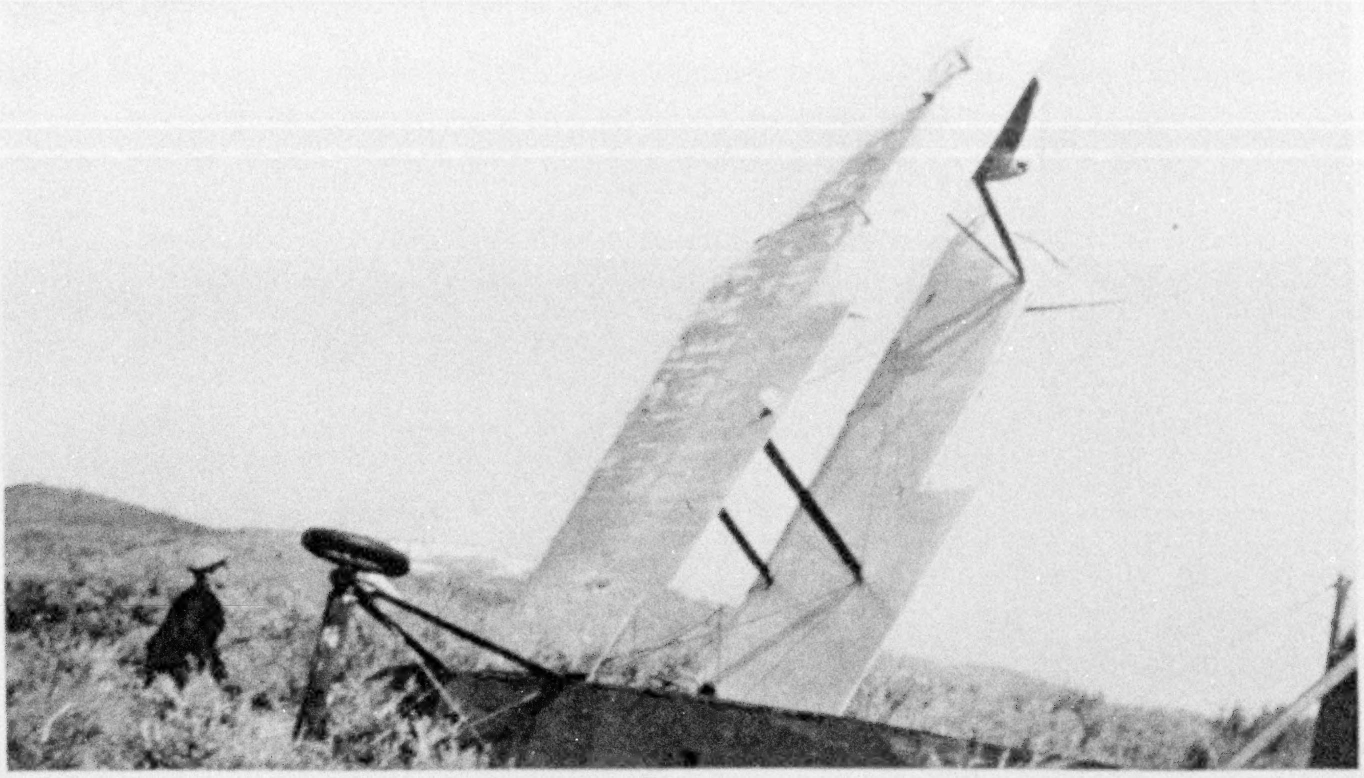
the world's first serious attempt at regular night-flying. Within a short time the lighted sector was extended westward to Rock Springs and eastward to Cleveland. To-day it is complete from New York to Salt Lake City.

THE THRILL OF NIGHT-FLYING

Almost a million miles have now been flown at night without the loss of a single letter. One fatality during the fiscal year 1925 must be recorded, however. A pilot who had but recently joined the Mail lost his head upon flying into a snowstorm at night, and in attempting to jump from the plane became fouled in his parachute.

"How did the older pilots take to night-flying?" I prompted Peter.

"Well, some were rather slow warming up to the idea. There was Lee, for instance, who said he'd try nights when there were no more thrills left for him in



Photograph by Frank E. Caldwell

A WRECKED MAIL PLANE ON THE MOUNTAIN SIDE

The pilot was unharmed and the mail forwarded intact. Planes have been forced down in the winter in such deep snow, in almost inaccessible places in the mountains, that they have had to be left until spring, as in the case of this plane. In every instance, however, the mail has been salvaged and forwarded.

day-flying. Then he made a few runs while one of the pilots was off on Christmas leave—and he's been at it ever since.

"At first Page used to swear that each night flight would be his last. He'd run into a cloud or a patch of fog, lose sight of every light in the world, and then he'd hit a bump and the engine would sputter and backfire—everything inky black—it made his hair crawl around under his helmet, he said.

"After a while the big searchlight at Omaha would show up, with the field boundary lights shining like jewels in the dark ground. Then he'd relent a little, decide he had imagined most of his troubles, and agree to try just one more run.

"He's been doing that now for more than a year and has over 100,000 night-miles to his credit. Claims he can smell his way into Chicago at night by the big starch factory on the canal bank.

"Lightning flashes close by blind a pilot temporarily, straining his eyes in the dark to make out vaguely familiar landmarks; but on real clear nights there's no trick to it at all.

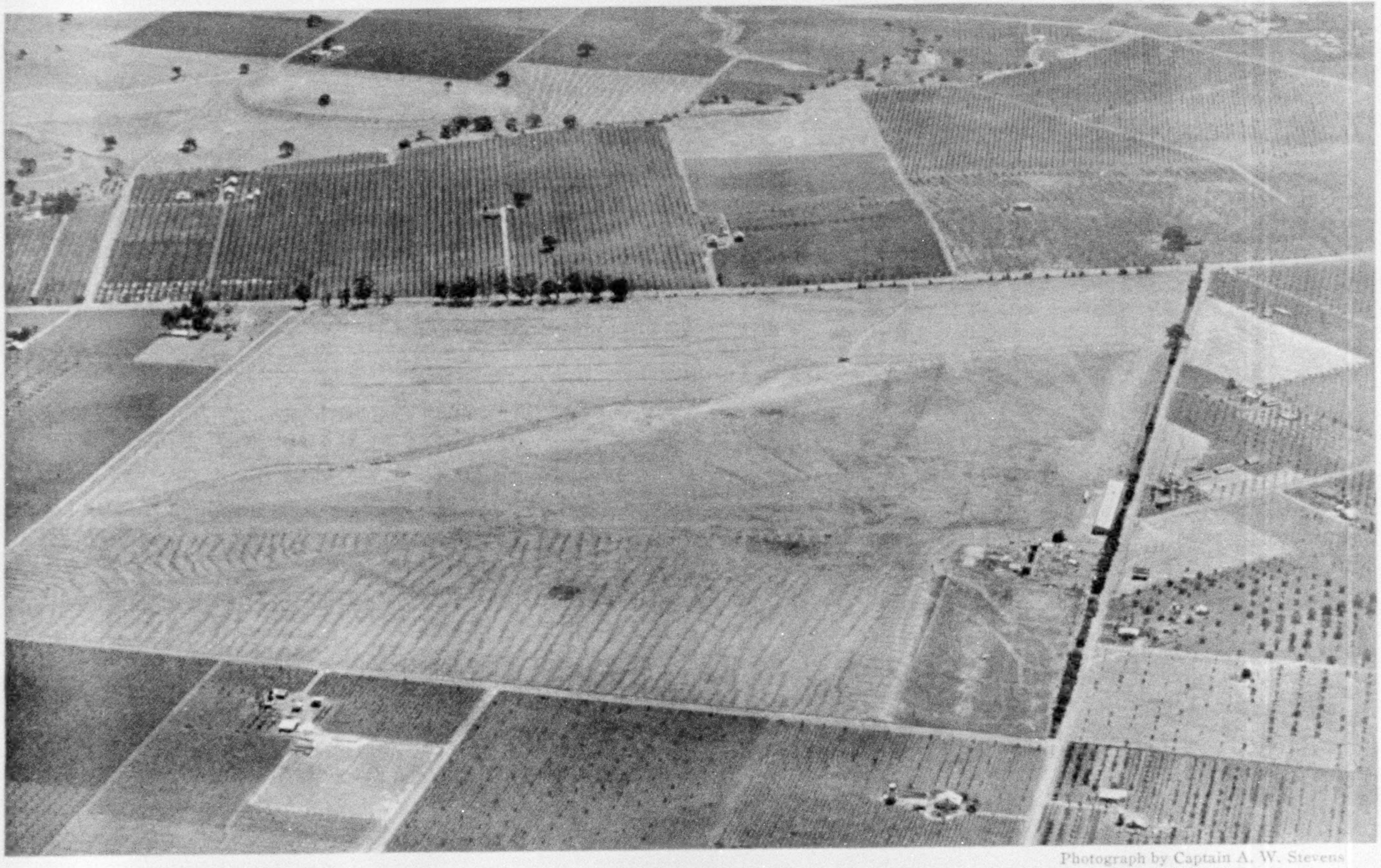
"Hopson reported he was 11,000 feet above Davenport, Iowa, on one trip, to take advantage of a strong upper wind, and he could see a glow in the sky over Chicago, 150 miles away; seven of the 25-mile beacon lights along the course were all visible at once.

"Sometimes, in bright moonlight, you can actually see the shadow of the plane against a black cornfield; and then again, when there's a ground haze, the moon shining on it makes it look like a blank wall—like flying into a damp blotter."

I remembered a flight of my own at night, over the Alleghenies, when a cold gray haze lay sleeping in the long, narrow valleys, and the lost beacon markers set on the intervening razorlike hills winked their tiny eyes of flame at me as if in derision. In flying, as in life, it is not what we see, but what we cannot see, that we fear.

A sense of utter solitude took possession of me, an illusion of disembodiment, while I seemed to float through the velvety sky like a lost soul, beyond the confines of a three-dimensional world.

There is an indefinable something about a cross-country flight at night among the wandering stars and phantom cloud shapes, where illusion and reality are



Photograph by Captain A. W. Stevens

THE AIR MAIL FIELD AT CONCORD, CALIFORNIA

This is the main western terminus of the transcontinental Air Mail line. Eastbound mail leaves from this field. Westbound, the Mail plane flies directly to Crissy Field, on the edge of San Francisco (just inside the Golden Gate), unless prevented from landing there by bay fog (see, also, illustration, page 56). From Concord Field to Crissy Field is only about 20 minutes by air.

hauntingly intermingled, that may well color one's whole "sentiment of existence" forever.

MAIL PILOTS TAKE WEATHER AS IT COMES

The Mail pilots, of course, must take the weather as it comes, and be prepared for the worst. They must know at an instant's glance every hill and house, every road and river, every "one-limbed cottonwood and obscure woodpile" along a track from 10 to 20 miles wide and nearly 500 miles long.

And they must know them under all the confusing conditions of which one can possibly conceive—forward or backward, wrapped in haze or fog, swept bare or buried in snow, under the trembling light of the stars or transformed by the occult power of the moon.

Like that vanished race of Mississippi River pilots, they must learn their long course as "you follow a hall at home in the dark"; and like them, too, they are as picturesque a type as in those old steamboat days when "every man was half a horse and half an alligator."

Pilot "Dog" Collins once remarked that he had so much to remember it made him stoop-shouldered.

Nor are all their troubles confined to the air. On stormy, threatening nights, when the clouds hang low over the hills, it is the custom to telephone to the emergency fields for last-minute advice on the weather. But the local, nonaëronautical caretaker often fails ludicrously to supply what is wanted.

"Some of them were so green at first," exclaimed Pete, "that they didn't know a propeller from wild honey! We called up a chap one night and inquired, 'How high is your ceiling?' He must have taken a quick glance around his office, for after a pause he said, 'About 10 feet, I think; but if you'll wait a minute I'll measure it'!

"Last winter I put through a call to a caretaker at one of the Nebraska fields. 'How's the weather?' I asked. 'Not so bad for this time o' year,' was his answer.

"But the worst problem is on the Eastern Division. The only caretakers that could be found for three of the Allegheny fields speak nothing but Pennsylvania Dutch—and this within 100 miles of Philadelphia!"

It is one of Pete's delightful weaknesses to succumb under the naïve promptings of confiding strangers, and to entertain them with the most picturesque and admirable yarns. For his sophisticated air-mates he usually reserves only dull and ineffectual facts.

"SAN FRANCISCO OR BUST"

On this night, however, I had broken through his restraint. He warmed to his subject and wandered off into impossible tales of his feats as an aërial dare-devil. My quiet warning to consider Mark Twain's injunction about dressing his facts in tights and not in ulsters fell on deaf ears. Hair-raising climax was piled on climax.

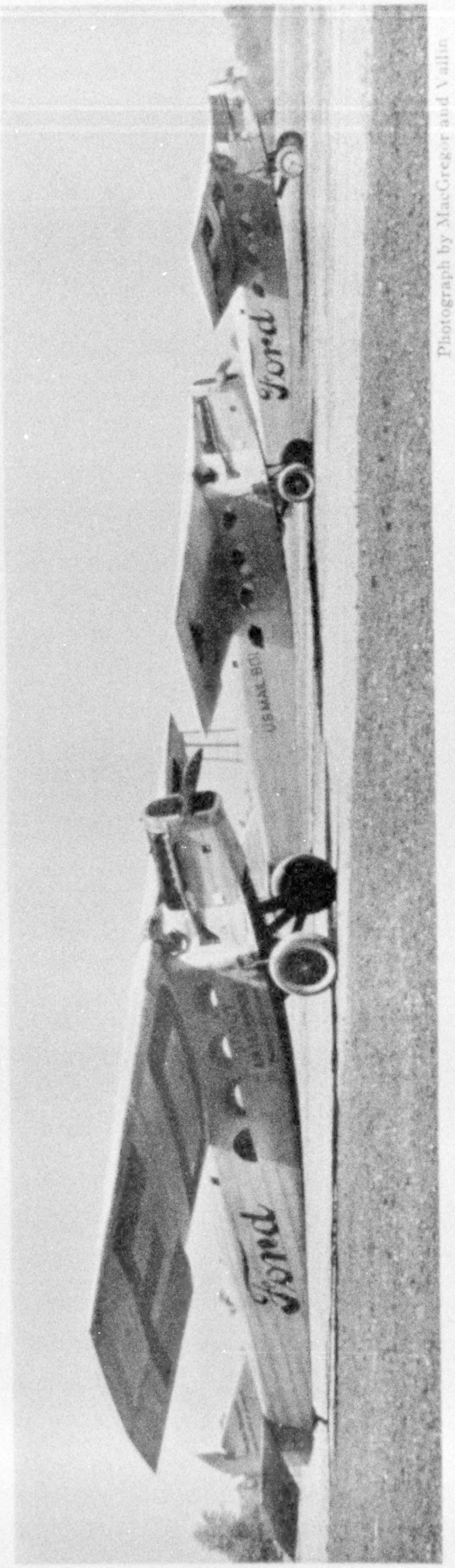
"Enough!" I cried out at last. "Tell that to the grease-monkeys! We both need sleep for our flight to-morrow. Remember—it's 'San Francisco or bust!'"

That last was an ill-chosen slogan, for at high noon the next day we very nearly "busted" landing at Elko, Nevada, 200 miles west of Salt Lake. A shallow, unmarked ditch lay hidden under the June grass at one end of the field, and into it we rolled, breaking the undercarriage. As an "office flyer" I may have some points, but as a ditch jumper I am a distinguished failure! (see page 45).

Nor was it any consolation to find the "bones" of three or four other planes whitening near by, under the scraggy sagebrush. Still, the damage was far from irreparable. A radio to the Army Reserve station at Salt Lake quickly brought a new undercarriage by airplane, and late the next afternoon we were in the air again, headed joyfully toward Reno.

By train the distance is more than 300 miles; but beyond Beowawe we deserted the tracks to follow the shorter air trail over Carson Sink, thereby saving 70 miles.

This land is all part of that vast inland plateau between the Wasatch and Sierra Nevada ranges. Cut by a hundred minor mountain groups that rise several thousand feet above the general 5,000-foot level, and draining to neither sea, it lies silently aloof, in ashen baldness, wrapped in an ominous neutrality, in a solemn suspense of waiting.



Photograph by MacGregor and Vallin

A NEW TYPE OF ALL-METAL PLANE WHICH IS BEING TRIED BY THE AIR MAIL

For the five years 1920-1924, inclusive, of the miles flown over regularly operated air routes, 26.6 per cent were in the United States, 4.4 per cent in Colombia and Australia, and the remaining 69 per cent in Europe, with 31.9 per cent in France, and 13.9 per cent in England.

There is a man, a stranger to me, who ought to make a flight over this country. He is the one who is reported to have said that if he owned Hades and Texas, he would rent Texas and live in Hades. At one place on our course, so "Tex" Marshall declares, it is 50 miles by trail to the nearest sheepherder's hut or miner's cabin—and no trail!

Almost every range between Salt Lake and Reno has made its bitter comment upon the progress of the mail, though, happily, no fatalities have resulted.

ALKALINE SALT GLISTENS LIKE GOLD

One winter morning Scott was hugging the Southern Pacific tracks, tearing along through the flying snow, when his ribbony guide disappeared in a tunnel and the wall of the mountain rose up sheer before him.

It was too late to turn. Pulling back hard on the control stick and jamming the throttle wide open, he just managed to zoom over the saddle. As he scraped the top, his tail skid uprooted a large clump of sagebrush; and there it hung under the fuselage, all the way to Salt Lake.

Still, this land is not wholly devoid of beauty. As the Arabs say of the Sahara, "There is heaven above."

Some of the scarred desert hills are marvelously tinted with all the colors of autumn woods; and once, as we detoured around a heavy rain squall, I thought we had discovered the pot of gold that lies at the end of the rainbow. On drawing closer I saw that that which glistened there was only alkaline salt.

Across the whole length of the western sky, in the glow of the sinking sun, hung the white crown of the Sierras, "the eastern wall of the land of gold," while in the fertile Truckee meadows at its base we made out Reno, the last stop between us and our goal.

Then came the great day. Straight toward the mountains we headed, following Truckee Canyon. As we climbed higher and higher, fresh beauty streamed into view and the grand, massive uplift of the Sierras spread out in all its ineffable glory.

I wonder if in all the world there is another range so sublime and yet so accessible.

Deep in a girdle of snow-mantled peaks lay the broad blue expanse of Lake Tahoe, its distant shore hidden under the dense shadow of a thunderstorm. The towering columns of the clouds pressed forward in noiseless tumult, dragging their rain-drenched skirts across the mountain tops, while we fled westward, seeking the pass before the storm should intercept us.

OVER "THE HUMP" OF THE SIERRAS

Just in the nick of time we slipped through a 9,000-foot saddle into Rubicon Canyon; and, as we passed, a great forked arrow of lightning crashed into the mountain side near by, throwing out a weird violet light, as if in sullen rage at our escape. We were over "The Hump" at last!

Below us Rubicon River leaped in wild abandon down the rocky steps of its canyon, while the pinnacles of the Sierras receded eastward, sharply silhouetted against the storm. A glorious, iridescent rainbow ring formed in the spray at the head of a cascade and, plunging over the ledge with us, slid down the waterfall to vanish in a deep pool at its base.

Far ahead, beyond the dark forest zone, we could see a yellow, hazy belt that marked the broad valley of the Sacramento, the "Grand Central Garden," as John Muir called it.

I squirmed around in the cockpit to point out some fresh marvel to Peter, and found him hanging over the side of the fuselage, lost in wonder and amazement. His Cheshire grin relaxed only for an instant, as he leaned forward to shout exultantly above the roar of the engine, "California, we are here!"

In a brief hour our long-dreamed-of goal lay spread before us. The vast basin of San Francisco Bay, beaten with dry sunshine, glistened and sparkled in its hilly cradle. Little ferryboats scampered across the water, trailing tiny white streamers of foam, and through the Golden Gate came floating long, lazy wisps of fog.

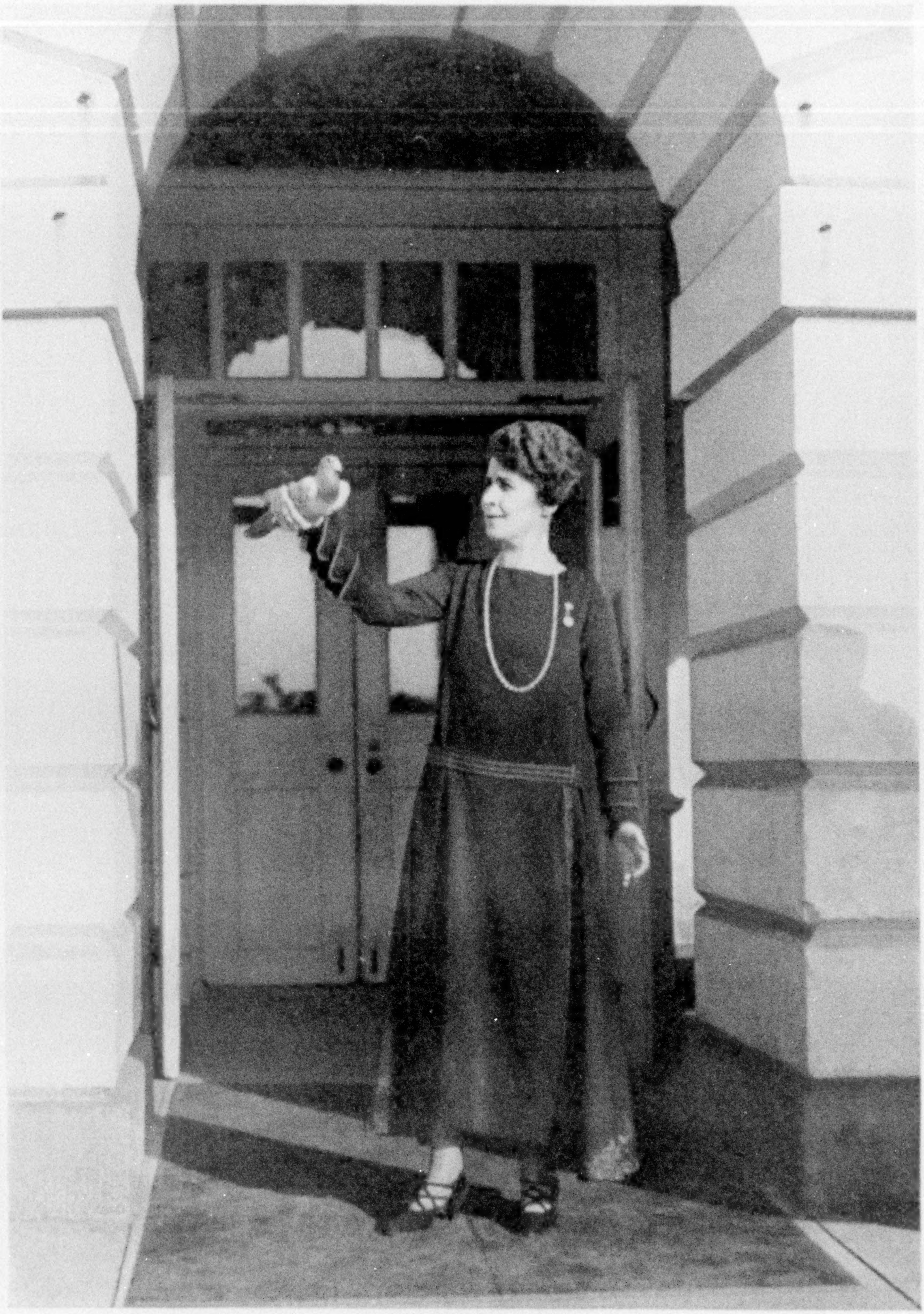
At the foot of the Presidio hill, beyond a thick carpet of buildings, lay the field. As our wheels touched the sandy ground, Pete gave a mighty shout, and the plane had scarcely stopped rolling before we both rose in our cockpits and, leaning across the windshield, solemnly shook hands!

THE MAIL PILOT'S VISION OF AMERICA'S HERITAGE

Such a vision of America as had been accorded us! Such an overwhelming revelation of the wonder and majesty of our national heritage! With it our faith in perfection had passed into vision.

We had trailed the elusive West to its last retreat, and had found that the West is not a place—only a stage of progress; everywhere one people, one civilization, one spirit, one all-embracing sense of nationality.

We had followed the Mail to its farthest outpost; had shared its joys and some of its dangers; and we felt, after the manner of the Romans, that perchance we could join the Mail pilot in his proud boast, *Civis aerius sum*—"I am a citizen of the air!"



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THE FIRST LADY OF THE LAND RELEASES A HOMING PIGEON

"I wish the Cleveland Show all possible success" was the message which this 500-mile prize-winning Racing Homer bore from Mrs. Calvin Coolidge, standing on the portico of the White House, Washington, to the annual show held by the Poultry and Pigeon Fanciers' Association in Cleveland, Ohio.

MAN'S FEATHERED FRIENDS OF LONGEST STANDING

Peoples of Every Clime and Age Have Lavished Care and Affection Upon Lovely Pigeons

By Elisha Hanson

With Illustrations in Color from Paintings by Hashime Murayama

EVEN before the dawn of history the breeding of fancy and racing pigeons was one of the favorite pursuits of man. Wherever historians delve and archæologists dig they find evidence of the interest of men of olden days in pigeons. That interest, in our own age of steam, electricity, and chemistry, seems to be growing.

There is a fascination about these birds that makes it possible for men and women in all stations of life to enjoy them. To some persons the breeding of pigeons opens the road along which to pursue an ideal, the ideal of beauty, in one of its highest forms.

Not all of us are artists, capable, by the use of brush and palette, of catching for a moment impressions of personality and of atmosphere which impregnate great canvases; but those of us who love pigeons have an opportunity to create something essentially satisfying through the infinite variety in which their colors may be blended.

TWO HUNDRED VARIETIES OF FANCY PIGEONS ARE BRED TO-DAY

No one knows how many varieties of pigeons are being bred in the world to-day, or how many have been bred and abandoned in the past, but it is estimated that of the fancy birds alone there are upward of 200 distinct kinds, and it is known that many of these have innumerable subdivisions, where the type is the same but the coloring of each is different.

In addition to fancy pigeons, where type and color make the variety and its subclasses, there are racing pigeons and utility pigeons. The latter are reared in large numbers, principally for food purposes, although during the last few years breeders have discovered that a purely utilitarian bird may be bred for beauty.

Finally, there are the Common pigeons, to be found in barn lofts, church steeples, and public parks and plazas the world over (see Color Plate II).

The great square in Venice in front of the Cathedral of Saint Mark, which is dominated by the Campanile and flanked by the Palace of the Doges, is perhaps the most celebrated public square in the world for its pigeons. In the snapshot album of nearly every tourist who has visited the City of Canals, there is a picture of the traveler feeding these birds before Saint Mark's (see page 83).

Madison Square, New York; the steps of Saint Paul's Cathedral in London, from which an effort is now being made to bar these birds, and Lafayette Square, in Washington, are other famous congregating centers for the world's pigeon population (see pages 86, 87, 110).

MANY POETS HAVE SUNG OF PIGEONS

It is difficult for a pigeon fancier to analyze and describe the reasons for his strong attachment for these birds. The writer still recalls his first impression of them, nearly thirty years ago, when he saw the timid, white creatures, their dainty red feet folded back under their breasts as they flew overhead, in an old country woodshed.

From that moment birds of all kinds, but pigeons more especially, have held a place of deep affection in his heart.

This sentiment is far from unique. Wordsworth experienced it one day while walking through his favorite forest. A dove was singing to its mate. The great poet of Nature paused to listen, and then, in the spirit of the moment, recorded his thoughts:

> I heard a stock-dove sing or say
> His homely tale, this very day;
> His voice was buried among trees,

> Yet to be come at by the breeze;
> He did not cease, but cooed and cooed,
> And somewhat pensively he wooed;
> He sang of love, with quiet blending,
> Slow to begin and never ending;
> Of serious faith and inward glee,
> That was the song, the song for me.

But Wordsworth was not the first poet to write of his love for pigeons. The Psalmists sang of them; Anacreon sang of them; Juvenal, Shakespeare, Mrs. Browning, Moore, and many others have recorded their love of pigeons in verse that will endure for all time. Some of the most charming strains of Liza Lehmann's song cycles are those which seek to convey through music the sheer beauty of pigeons.

ARABIAN LEGEND EXPLAINS PIGEON'S RED FEET

Literature, legend, and history are rich in pigeon lore and in all the records of warfare, there is nothing more stirring than the accomplishments of our own little feathered warriors in the great World War.

In legend, there is nothing more beautiful to a pigeon fancier than the story of the dove which brought to Noah the message that the great flood had subsided. According to the Arabs, this bird, after carrying to the Ark the olive branch signifying that the waters were falling, flew away on a second trip, from which it returned with traces of red mud on its feet, thereby proving that it had been able to alight on the ground; and, as a result of this information, Noah prayed that the feet of these birds might forever continue of that reddish color. Noah's prayer must have been heard, for the feet of all pigeons to this day are red!

We learn from Xenophon's "Anabasis" that the love of pigeons was widespread in those parts of the world which the Greek army traversed. We also learn from the great Roman historian and naturalist, Pliny, that ancient Rome was as keen about these birds as is modern Belgium.

Pliny tells of Lucius Axius, who was celebrated because of the quality of his birds and also for the high prices which they commanded—often as much as the equivalent of $75 a pair.

That price seemed high to Pliny, but a few months ago a Racing Homer brought more than $1,300 at auction in England. Since that time an American fancier imported a black Tumbler cock for which he paid $1,000, and I myself have paid more than the old Roman's price for a pair of birds, and have also refused more than six times his price for one of my own breeding.

ENGLAND'S KING IS A PIGEON FANCIER

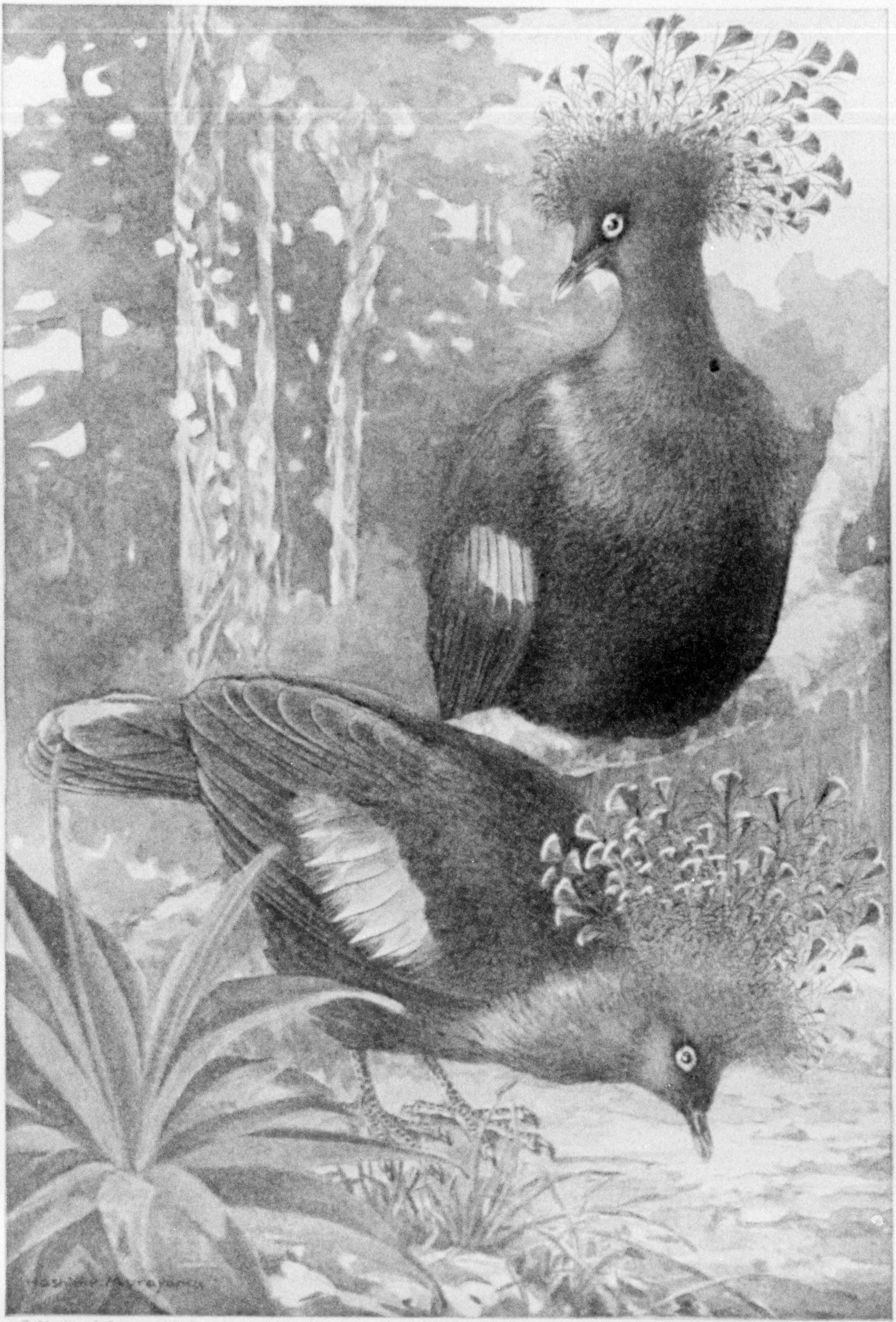
Probably the best-known pigeon fancier in the world to-day is King George of England, whose lofts at Sandringham contain the finest racing specimens obtainable. From those lofts birds have gone into many humble English homes, accompanied by the sovereign's best wishes, there to produce winners for their modest owners. His Majesty's grandmother, Queen Victoria, was also an ardent fancier, visiting pigeon shows whenever possible and spending many hours in her aviary.

Queen Victoria prized the Jacobin (see Color Plate IV) above all other varieties and made a point of obtaining outstanding specimens from time to time to improve her own birds. She did not compete in the shows, but Jacobin fanciers sent some of their best birds to her lofts and frequently received for their own even better individuals, produced under the Queen's loving supervision.

Thousands of years before the days of King George, another king, Rameses III of Egypt, gloried in his donations of pigeons to the temples of Thebes, Heliopolis, and Memphis. Since his time, down to the present, the Orient, especially Mohammedan countries, has regarded pigeons as sacred. Only recently a riot occurred in Bombay because some Europeans killed the revered pigeons in one of the city squares (see illustration, page 102).

PIGEON RACING IS BELGIUM'S NATIONAL SPORT

In Belgium, pigeon racing is the national sport, in which as many Belgians, in proportion to the country's population, are as keenly interested as are Americans in baseball, football, golf, or horse racing. The Grand National of Belgium, in which pigeon fanciers from all parts of the country participate, provokes far more interest



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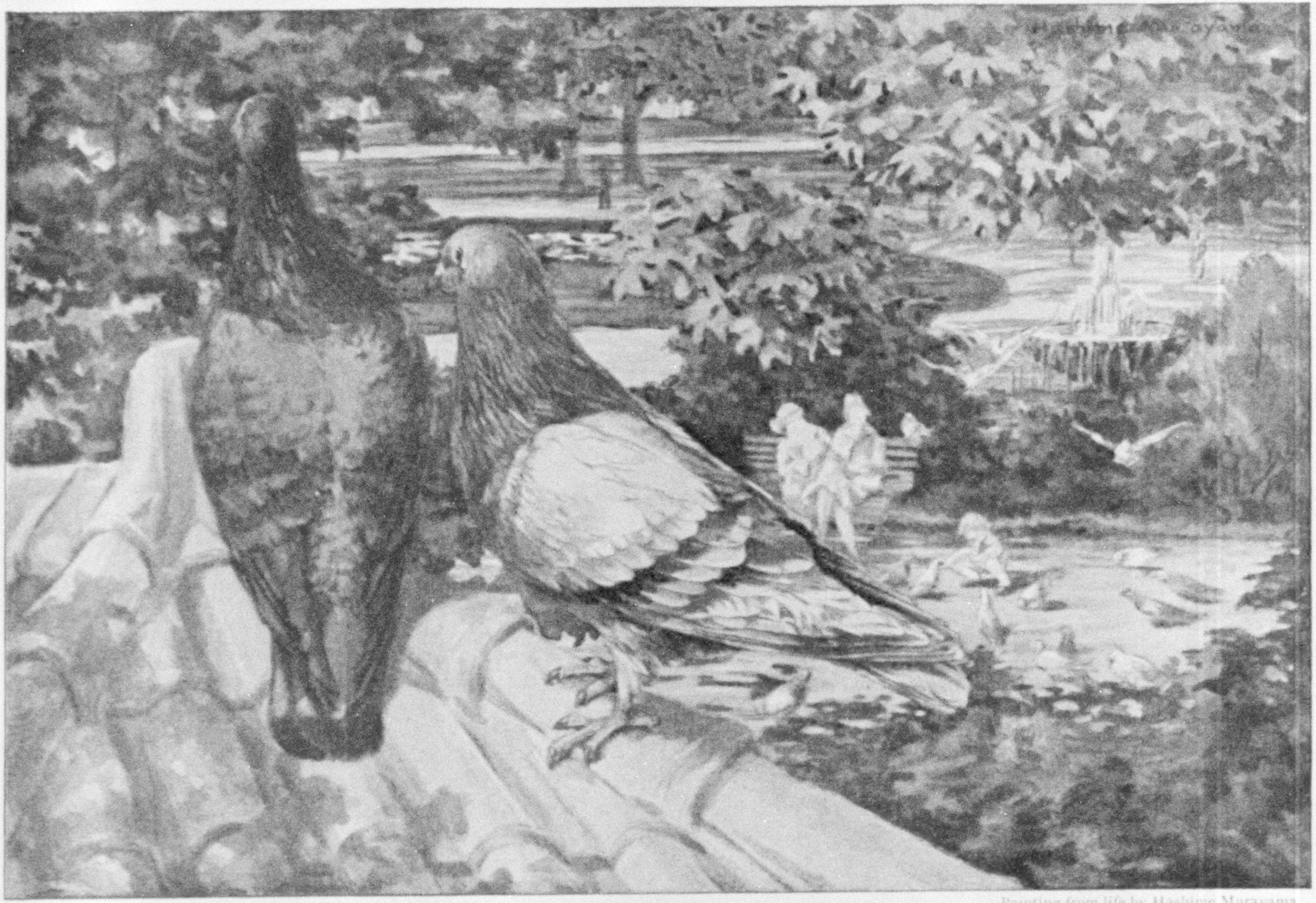
Painting from life by Hashime Murayama

VICTORIA CROWNED PIGEONS

These birds, with filmy, fan-shaped crests, are among the largest and most spectacular of the whole pigeon group. They are peculiar to New Guinea and a few neighboring South Sea islands and are from 25 to nearly 34 inches in length. This particular species (*Goura victoria*) inhabits the islands of Jobi and Mysori.



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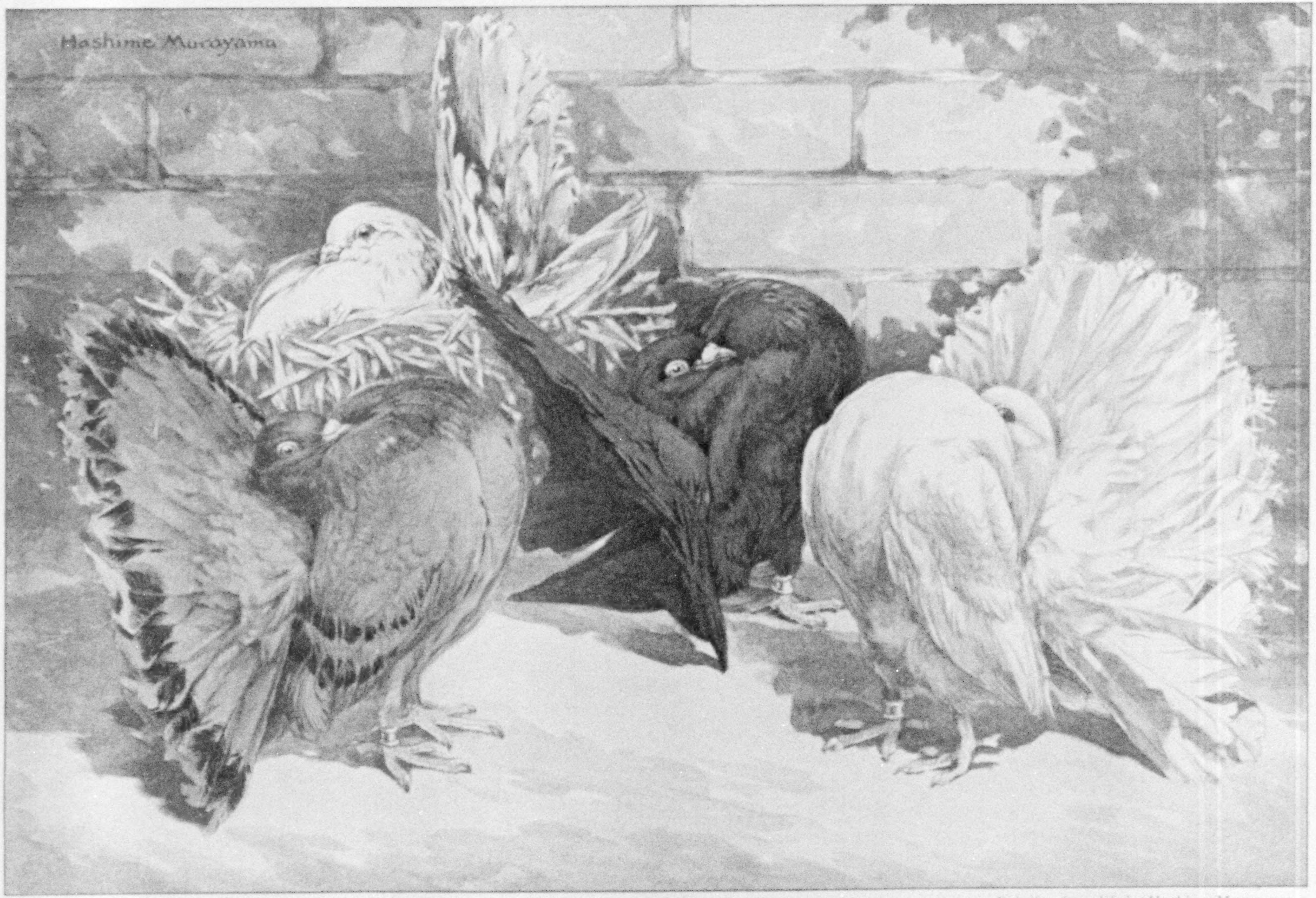
PARK PIGEONS

The Common or Park Pigeon gets its name because of the constancy and fearlessness with which it frequents parks and other public places.



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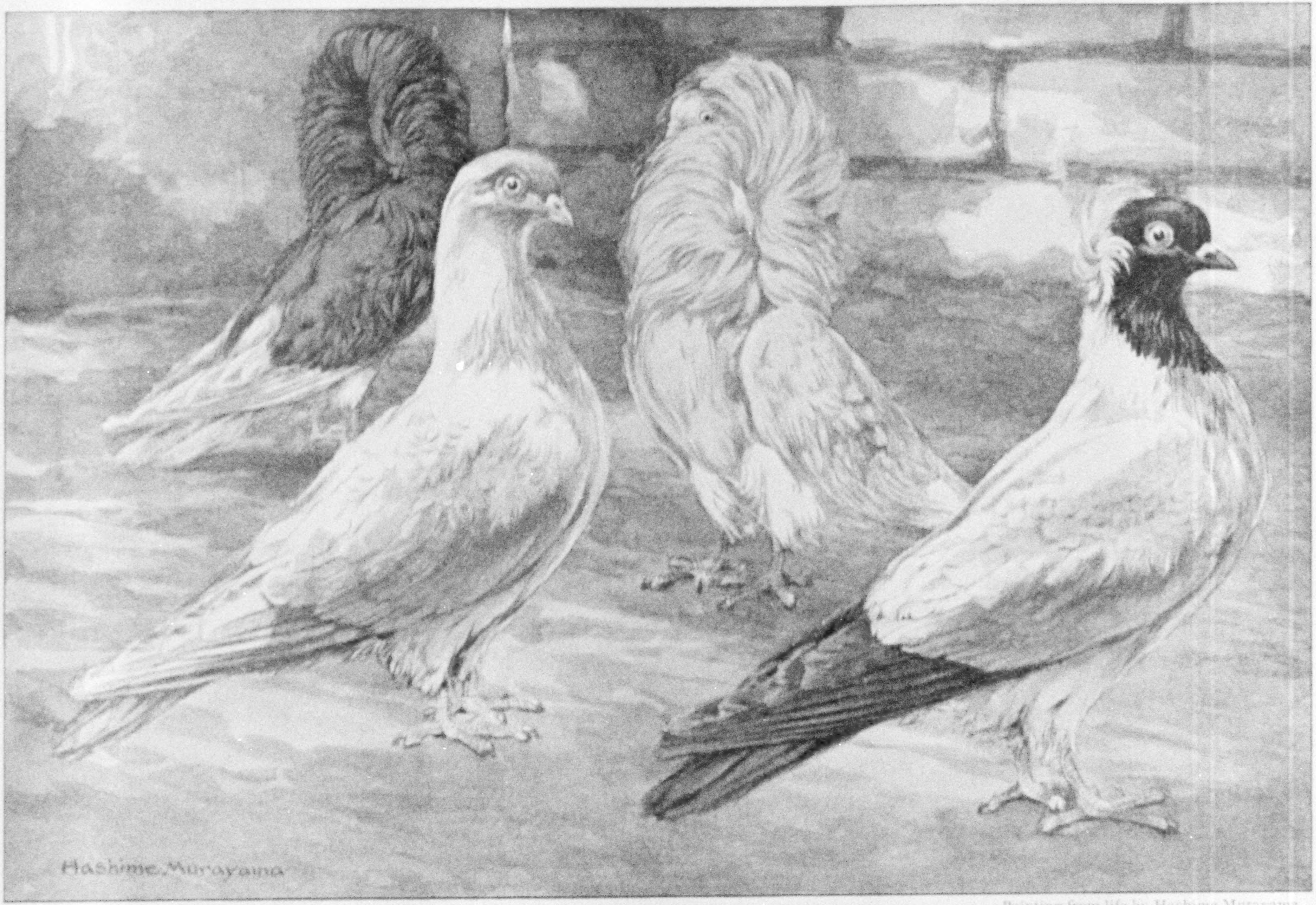
FANTAILS

Blue (left), Black (center), White (right and on nest). Originally from Hindustan, this picturesque breed has long held a high place in the affections of Anglo-Saxon pigeon fanciers.



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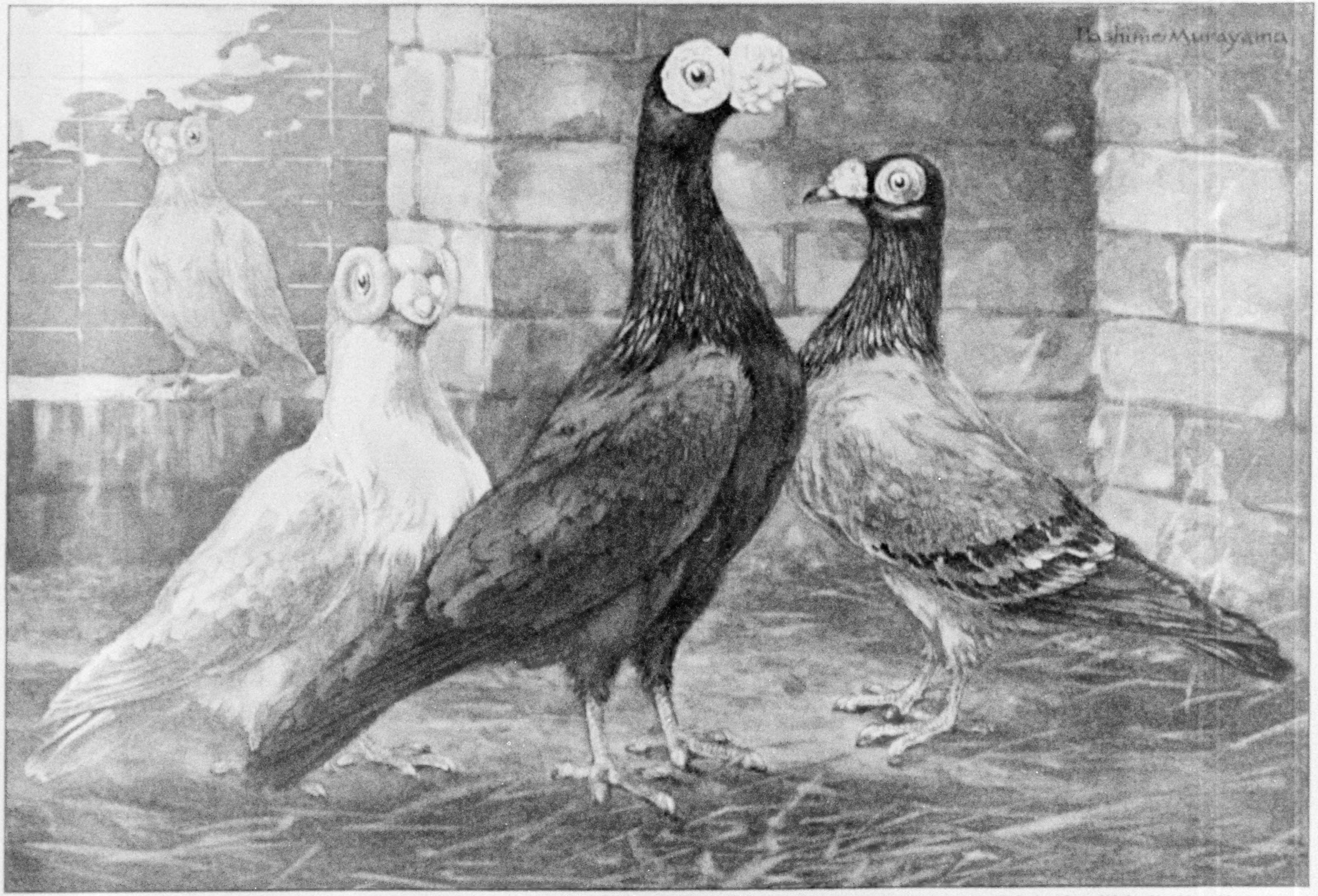
PIGEON ECCLESIASTICS

Jacobins (background), Helmet (left foreground), Nun (right). The Jacobins and Nuns are two very old varieties wholly dissimilar in appearance.



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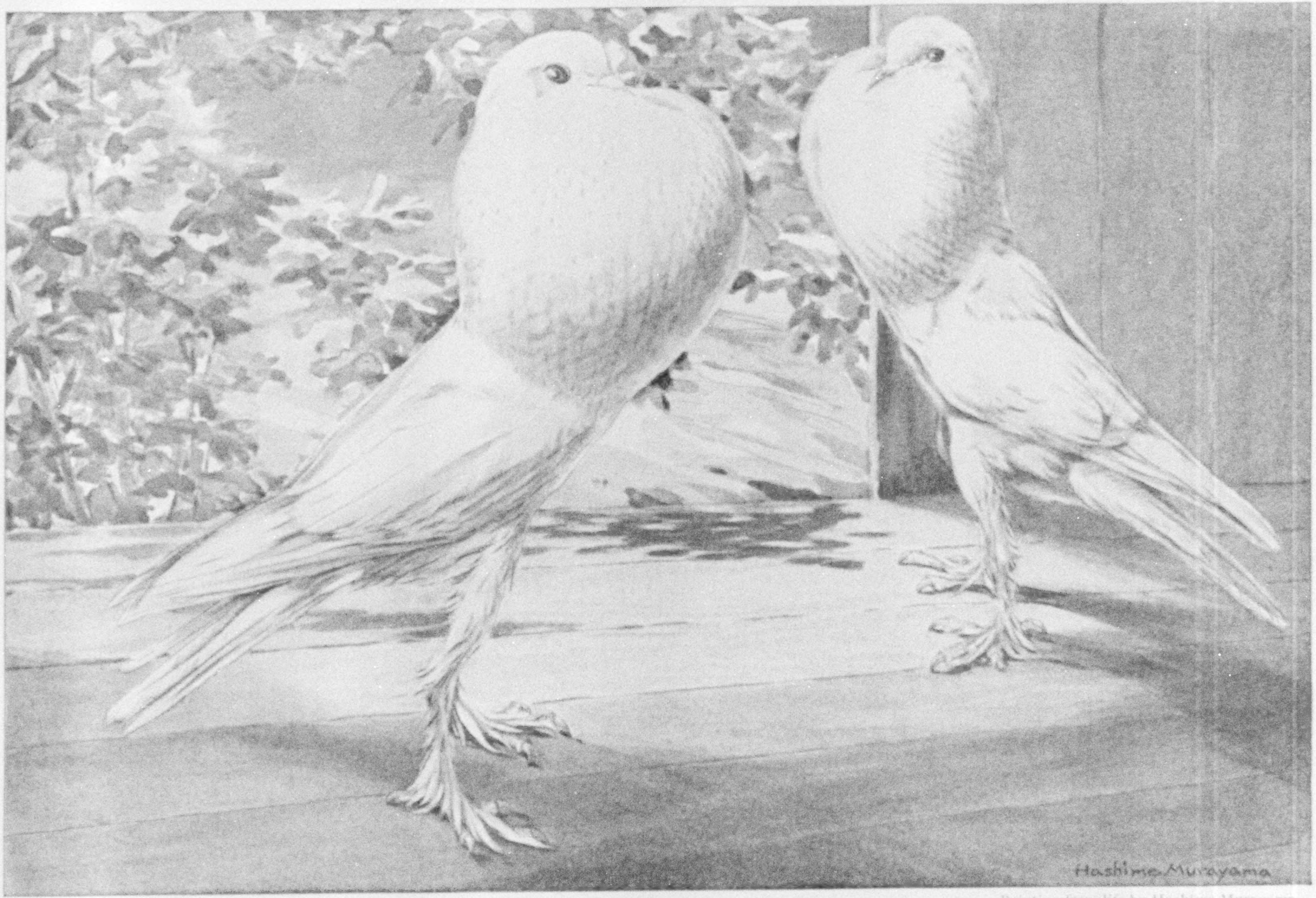
A PIGEON MEDLEY

Barbs (left), Carrier (center), Dragoon (right). The Barb is a toy pigeon in sharp contrast to the large, bold Carrier and Dragoon, but all three of these types are distinguished by wattles or "rosettes" around their eyes and beaks.



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POUTERS

At once the aristocrat and the buffoon among pigeons, the Pouter is a jovial and convivial bird whose name has no bearing on his personality, for he is seldom out of sorts.

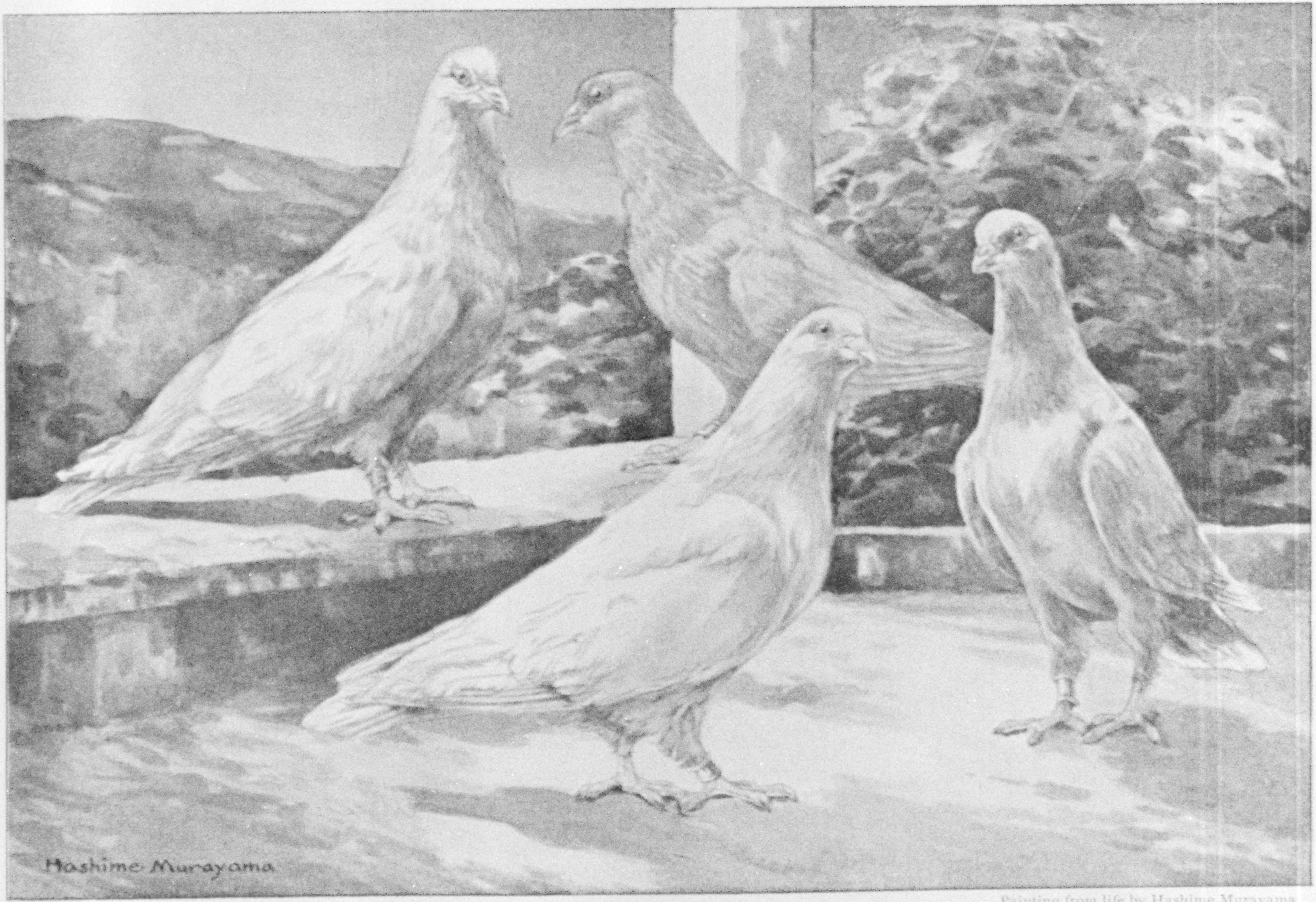

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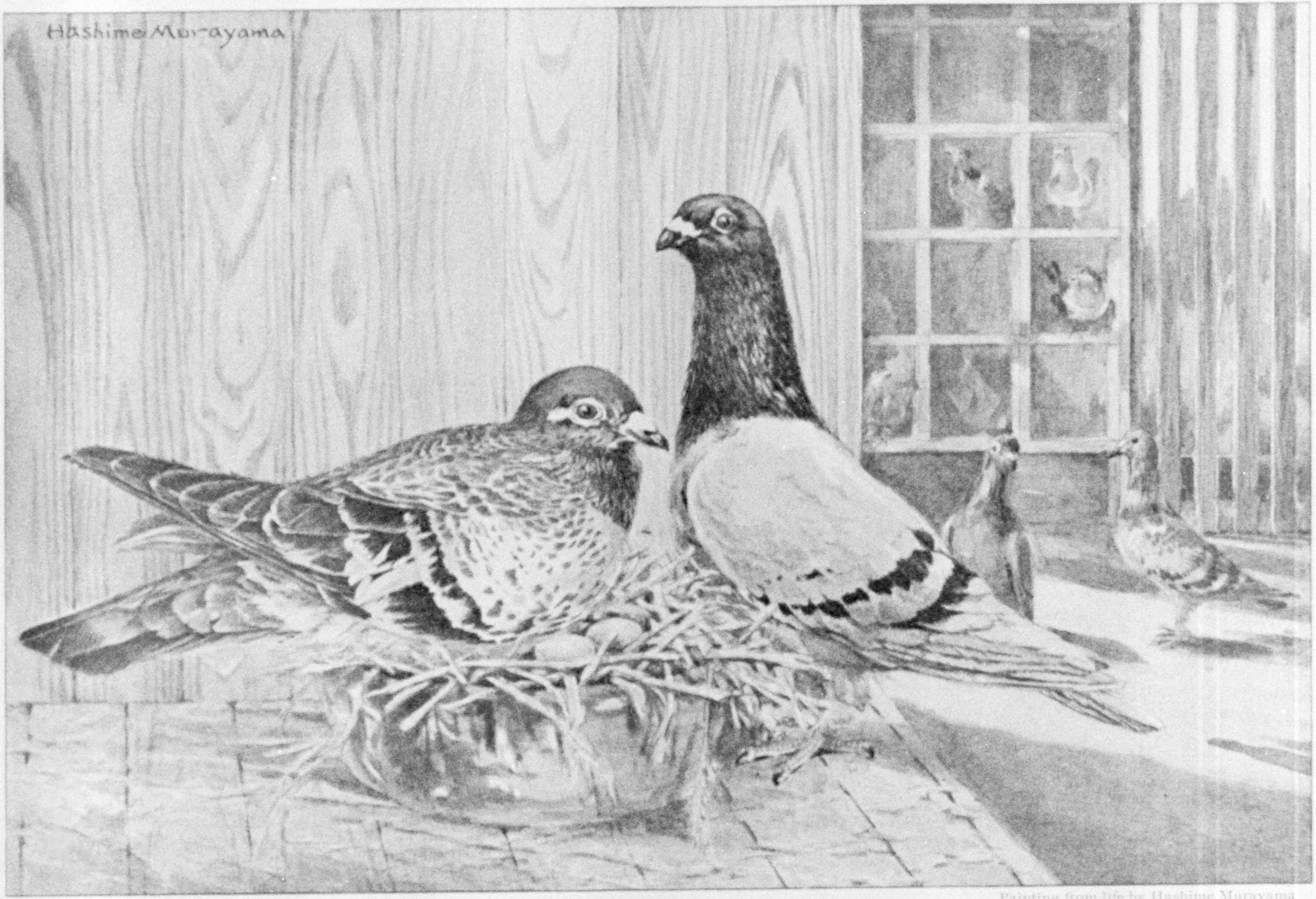
TABLE PIGEONS

Swiss Mondaine (upper left), Carneau (upper right), and Kings (foreground), are large birds bred mainly to supply the ever-present demand for squabs.



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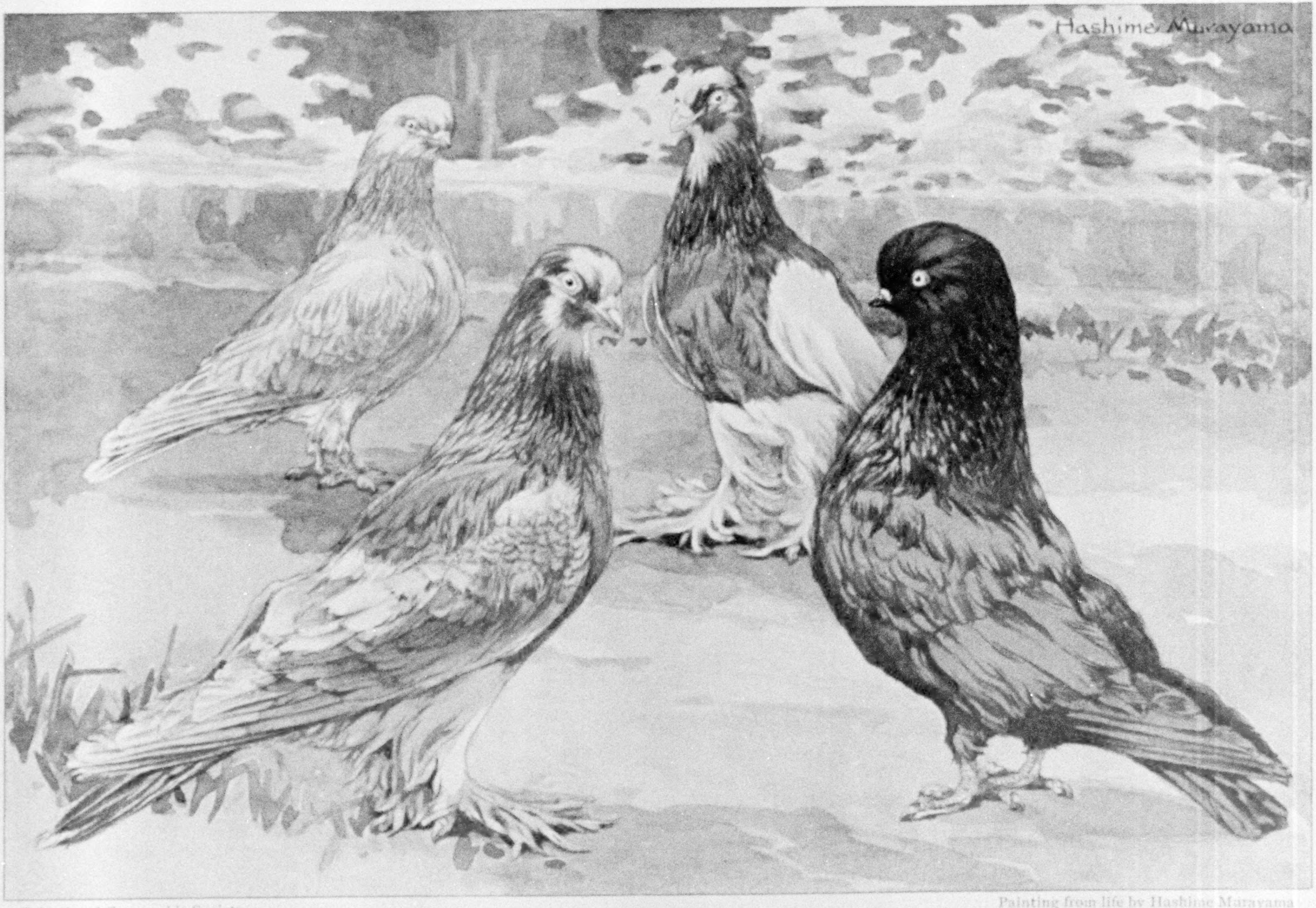
RACING HOMERS

These fine birds have been used as messengers by man for ages. They are possessed of rare speed, courage, and intelligence, as well as an unerring homing instinct.



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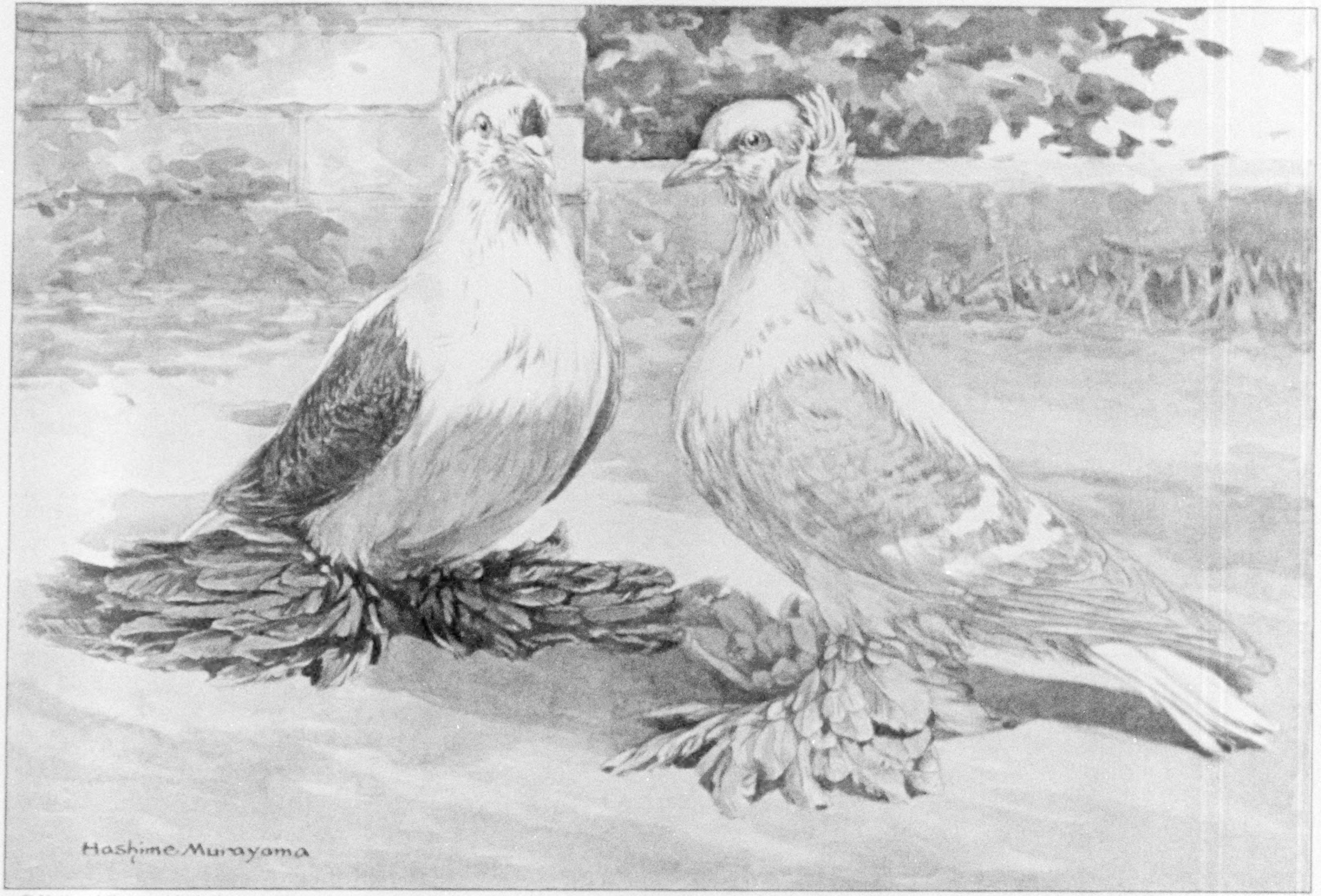
TUMBLERS

This variety occurs as "Muffed" (lower left and upper right), and "Clean-legged" (lower right and upper left). They are the stunt flyers and acrobats of the pigeon world and enjoy a widespread popularity.



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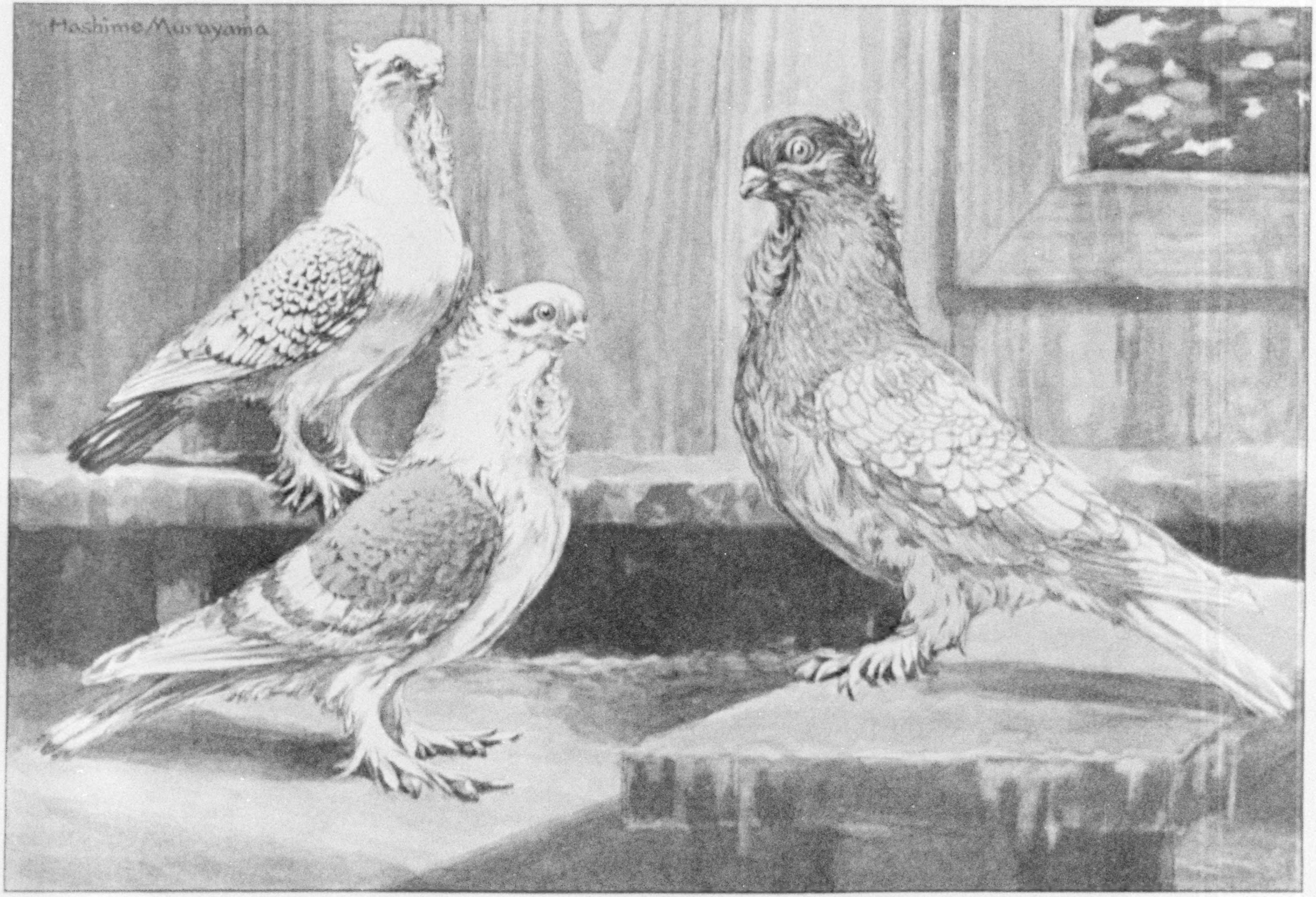
SWALLOW PIGEONS

These are a variety of German toy birds with "feather-duster" legs and shell crests at the back of the head.



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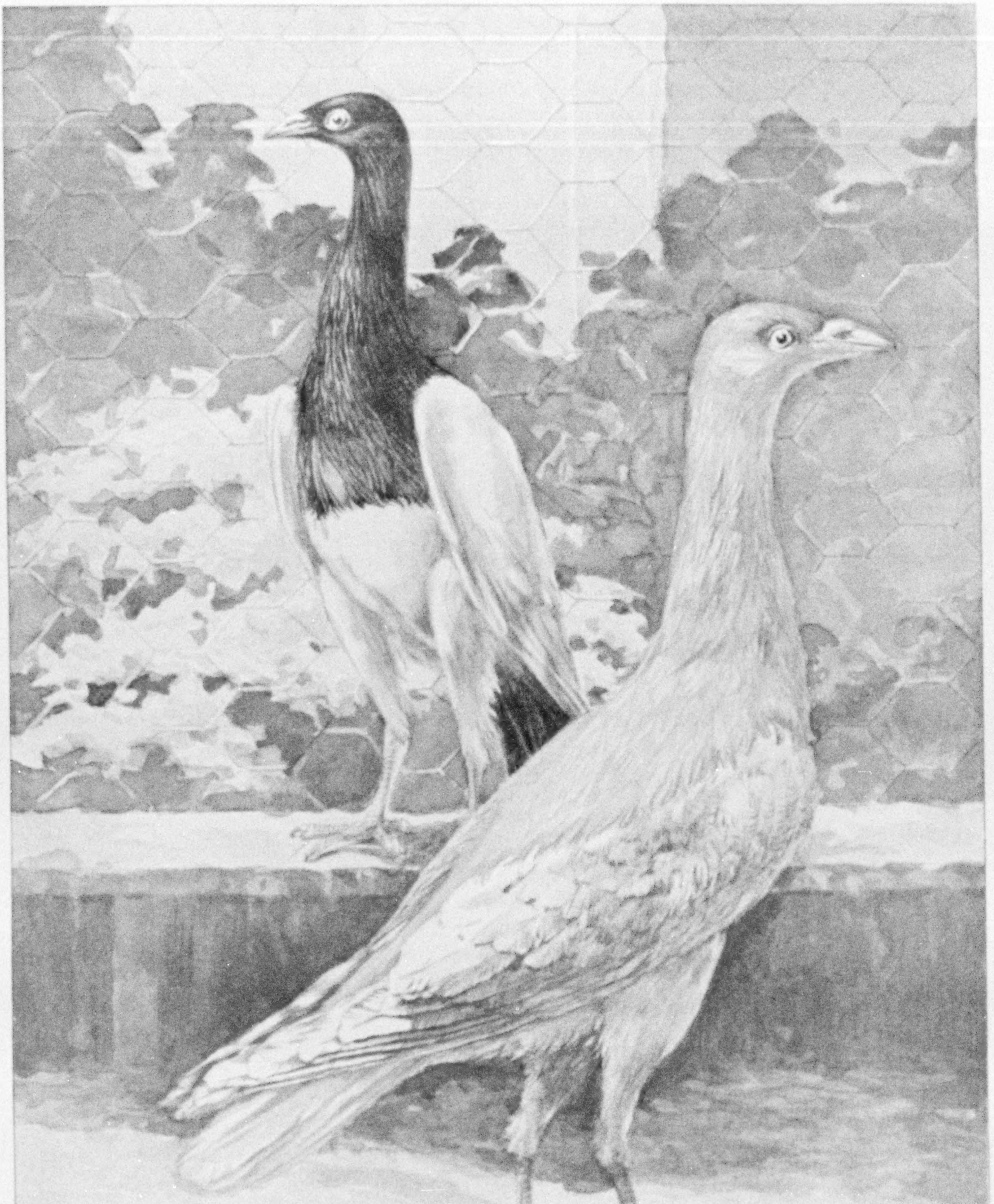
ORIENTAL FRILLS

The Satinette (upper left), Bluette (lower left), and Blondinette (right), originated in Asia Minor centuries ago. They are among the most beautifully colored of pigeons.



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MAGPIES

This branch of the pigeon family comes by its name because of the resemblance in the color of its plumage to that of the wild magpie.

there than a world's series in baseball, the Kentucky Derby, or a Harvard-Yale football game excites in the United States.

Every village has its Homing-Pigeon club, and throughout the racing season thousands of birds are shipped to France and other adjoining countries each week for the fly back home.

So keen is the interest in these races that some clubs now employ airplanes to carry their birds to the releasing station, thus reducing the time they are en route and thereby giving them additional strength for the flight.

THE ORIGIN OF THE DOMESTIC PIGEON IS IN DOUBT

Naturalists look for the original stock of all domesticated pigeons in some wild variety, but they are not in accord as to whether it is the Stockdove (*Columba œnas*) or the ledge-roosting Blue Rock Dove (*Columba livia*), varieties of which are found in Europe, Asia, and Africa. The more general view inclines to the latter, for when domesticated birds are bred promiscuously, without regard to type or color, their offspring will revert rapidly into birds of the type of the wild Blue Rock Dove.

The love of pigeons is universal. It is older than the love of flowers, and certain varieties of pigeons shown to-day probably have been distinct in color and type characteristics longer than the most distinct varieties of any other domestic bird, flower, or highly bred animal now known.

Common pigeons are found everywhere. They look after themselves, with only incidental attention from men, and while they are inhabitants of cities and smaller urban communities, their lives, in so far as selective breeding is concerned, vary not at all from the lives and existence of wild birds generally. This article deals only with the domesticated birds.

PIGEON LOFTS ARE FOUND FROM CELLARS TO SKYSCRAPER ROOFS

The house in which pigeons are kept is called a loft—a name probably derived from the fact that the Common pigeons usually nest in the highest parts of buildings.

Lofts are of various kinds and sizes. In New York there are lofts on top of some of the tallest skyscrapers, but across the river, in Jersey City, a Racing Pigeon enthusiast for a time kept his birds in the basement and actually flew them from his cellar window. In Belgium many fanciers use the top story of their homes, and in England breeders utilize attic and outdoor lofts, as well as housetop lofts.

The chief essentials of a loft are light, air, cleanliness, and plenty of room. It should be protected from drafts and secured against such natural enemies as rats and snakes.

In the loft, the domestic life of pigeons is similar to that of men. The birds mate in pairs, and unless separated by man they will remain loyal until death. Unlike practically all other birds and contrary to an old superstition that they will not breed in February, they will breed the year round.

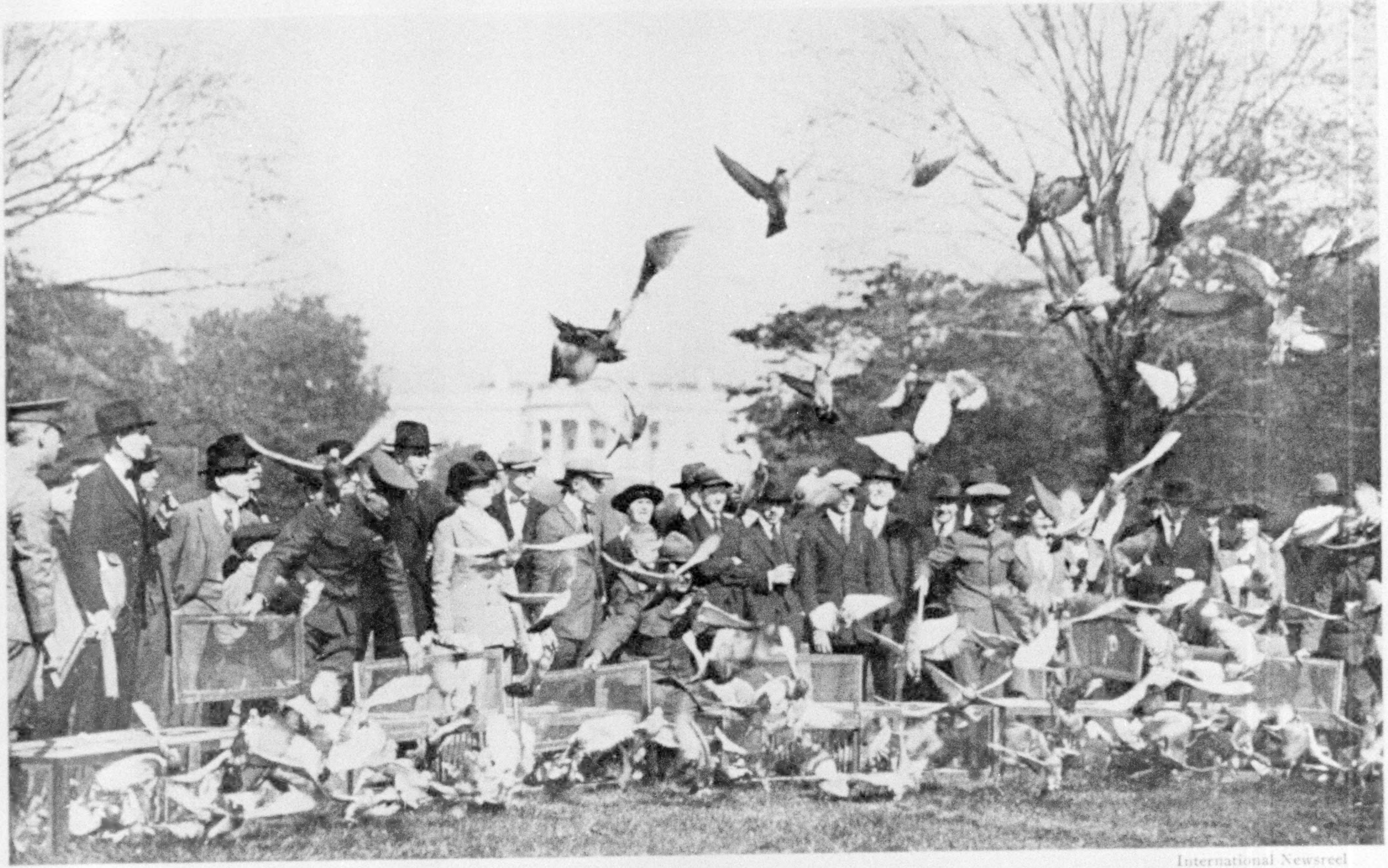
No fancier, however, who is striving for improvement in his variety will permit his birds to breed continuously, as the parents are weakened thereby, resulting in defective young. To prevent this, the fancier usually mates his birds in February or March and separates them in July or August, keeping the cocks and hens in different lofts over the autumn and winter months.

If satisfied with the results of his breeding operations in one season, a fancier may remate the same birds the next season. If not satisfied, he will change mates, but to be successful he must keep the broken pair separated; otherwise they will go back to each other.

THE MALE PIGEON SELECTS THE HOME SITE

When the birds are mated the male selects a nesting place and immediately drives his mate toward it. Both share in the work of building the nest, and the first egg is laid from 8 to 12 days after mating. Until this egg comes, the male bird never ceases in his attentions to his mate, and fights off any other male which approaches her.

Pigeons lay but two eggs (sometimes only one), about 48 hours apart. The young, if all goes well, hatch 18 days after the second egg is laid, and reach full size in four weeks, when they are weaned. Before that time the mother lays another pair of eggs, and thus begins rearing a



International Newsreel

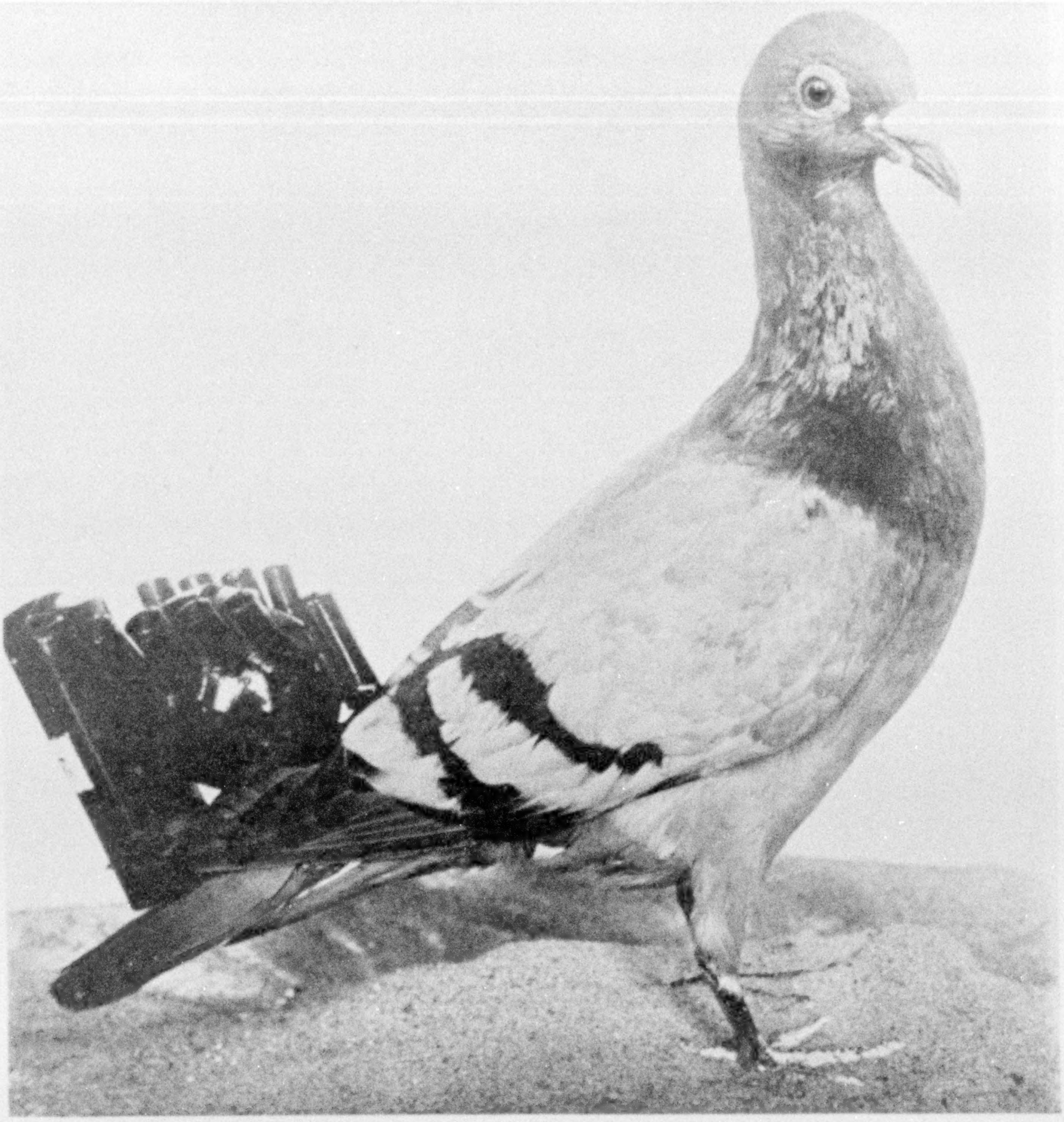
THREE HUNDRED ARMY PIGEONS BEING RELEASED FOR A TEST FLIGHT FROM THE WHITE HOUSE GROUNDS, WASHINGTON

Their lofts are at Camp Alfred Vail, Oceanport, New Jersey.

Photographs by International Newsreel

"PHILOPENA": THREE FRIENDS IN CENTRAL PARK, NEW YORK

PATROLMAN WHELPLEY AND "PEGGY," CENTRAL PARK, NEW YORK



© International Press Photograph

A PIGEON WITH A CHINESE WHISTLE

The whistles are of two types, one consisting of bamboo tubes placed side by side, the other based on the principle of tubes attached to a gourd. Though they look clumsy, they are very light, and are attached to the tails of young pigeons by means of a fine copper wire. When the bird flies, the wind blows through the whistles and sets them vibrating. The Chinese explain their love of this aërial music by saying that the sounds keep the flock together and frighten off birds of prey.

second family before the first is grown. The female pigeon sits on the eggs from late afternoon until mid-morning. The male bird assumes the responsibility for the remaining hours.

After the young come the male parent is by far the best provider. The squabs are fed in a most unusual way. The parents eat first, digest the food, then regurgitate it for the young. At first this food looks like milk, and is often called "pigeon milk," but as the squabs grow older the food hardens, and just before they leave the nest, whole, undigested grains are fed to them.

Pigeons should be fed hard, whole, dry grains, and grit and fresh water should be kept before them constantly.

In warm weather they should be given baths. No matter how hot or cold the

Photograph by A. E. Pfahler

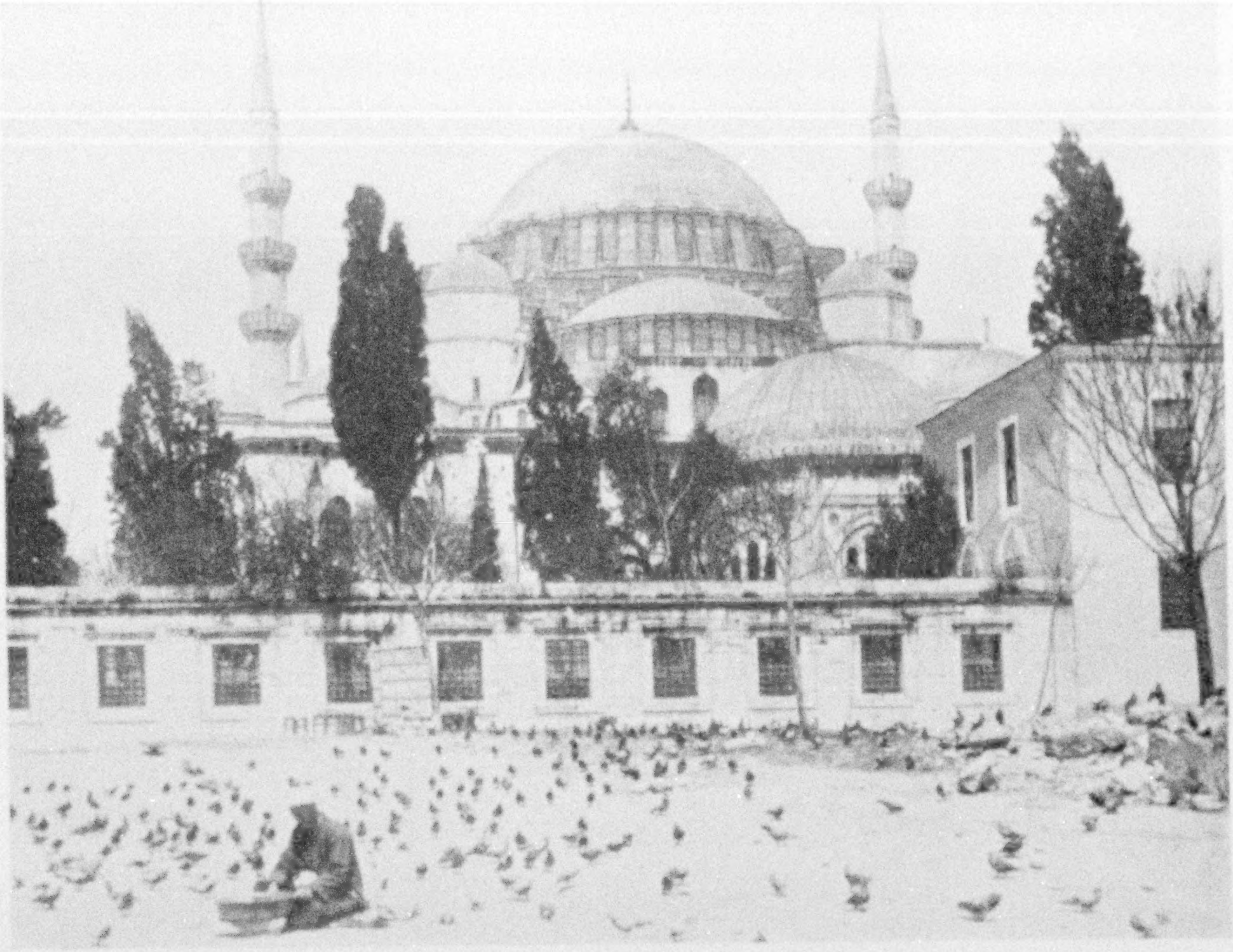
PIGEON CITIZENS OF AJMER, INDIA, VISIT THE RAILWAY STATION

Founded about 145 A. D., Ajmer is a handsome city on the Rajputana Railway between Bombay and Delhi, with an important trade in salt.

Photograph by Dr. Osvald Sirén

PEKING MERCHANTS DISPLAY THEIR FEATHERED CHARGES IN THE PIGEON MARKET

The Chinese are devoted bird fanciers, and a corner of many a city is given over to an interesting bird market, where several varieties are sold. Nearly every home has at least one bird, and pigeons vie in popularity with parrots, pheasants, and canaries. Pigeon eggs are also a prized article of food. Peking manufactures many of the ingenious pigeon whistles (see illustration, page 80).



THE MOSQUE OF DOVES: CONSTANTINOPLE

The popular name of the mosque of Sultan Bayezid II is especially fitting, though numbers of these birds flock around all the mosques. Moslems, in their preservation of the ancient Oriental reverence for pigeons (see, also, illustrations, pages 89 and 102), do not disturb any bird that nests about the holy buildings.

weather may be, pigeons will bathe every day of the year if the facilities are provided; but winter bathing should be carefully regulated, so that the birds will not remain in the water too long and take cold. My birds are never given a bath in winter except on bright, sunny days, and even then the water is left before them for a few minutes only.

Pigeons are long-lived. Some are said to have been bred at 16 years, but usually before that time such improvement has been made that the fancier has discarded them for younger specimens.

BEAUX AND POLITICIANS IN THE PIGEON WORLD

For sheer magnetism and intelligence, pigeons are equaled by no other bird. There are politicians among them, just as among men. Any loft of Pigmy Pouters gives one an impression of visiting a dignified conclave on a gala debate day. One will see a lordly little fellow holding his place in disdain of the goings on around him. Close by, a strutting cock parades up and down, bowing and scraping, preening himself, and eying the gallery all the while. If the slightest attention is given him, he will strut and blow all the more.

There is also sure to be a quarrelsome chap, who delights to upset the reserve of the dignified gentlemen and to trip up the grandstander on his parade, while up in the nesting compartments will be interested observers.

The scene in a loft of Carriers, where the birds are not penned in individual compartments, will often suggest a veritable battle royal in the prize ring, and one peep at dainty little Fantails at play stirs the imagination to visions of Colonial days, of the minuet, hoop skirt, and

Photograph by Mrs. Emma L. Rose

PIGEON FAVORITES IN OLD ANDALUSIA: SEVILLE

International Newsreel

AN INTERRUPTED LUNCHEON PARTY IN THE PIAZZA OF SAINT MARK: VENICE

The famous Cathedral of Saint Mark and the Campanile are here almost obscured by clouds of pigeons, which feed daily in the square.

Photograph by Clifton Adams

"IT'S MY TURN!"

Beauty of form and coloring, but especially their simple confidence and gameness, give pigeons an undeniable charm for persons in all stations of life. They have enriched literature, legend, and history, and they provide mankind with food, amusement, and a reliable means of communication. Their record of sheer grit and brilliancy of performance with the Allied troops during the World War is a striking story (see text, page 86).

crinoline. Every variety has its distinct characteristics; every bird has its personality.

While pigeons have been used in war since the siege of Troy, not until the World War was widespread interest focused on these little feathered soldiers of the air.

The modern Racing Pigeon was developed in Belgium, probably in Antwerp, within the last century; but this racing specimen is entirely different from the birds used to carry messages in the olden days. Whatever the earlier varieties of Racing or Homing Pigeons may have been, that now used for racing during times of peace and for communication during periods of war is one of the most marvelous results of selective breeding accomplished by man in any line of naturalistic endeavor.

The modern Racing Homer weighs about 16 ounces. It may be blue, blue checker, black checker, black, red, red checker, mealy, silver, dun, and splashes, since it is not bred for color, but for type and racing ability. The best fanciers of Homing Pigeons seldom mate two birds of the same color, since emphasis of color breeding is believed to minimize strength and racing ability.

PIGEONS OUTDO FAST TRAINS IN SPEED

Racing pigeons are flown successfully from distances of 10 to 1,000 miles; but, as with race horses, different types are used for the various distances. There are sprinters among pigeons, just as among

Wide World Photograph

FINDING COMFORT IN NUMBERS: BOSTON, MASSACHUSETTS

These birds, huddling beneath a tree on Boston Common during a severe blizzard, look after themselves, as a rule, but their friendliness causes them to respond readily to incidental attention from man (see, also, page 96).

men and horses; there are also distance birds, just as there are Marathon runners from Finland and Derby horses from England.

Light birds make the sprinters, but the big ones go the route. They make various speeds, according to weather and atmospheric conditions. A good average speed, under fair racing conditions, is a little more than 1,200 yards a minute.

Pigeons are capable of thirteen hours' sustained flight, and can fly as far as from Chicago to Washington within that period. This means that they travel more swiftly than our fastest trains.

It takes the Capitol Limited, the crack train of the Baltimore and Ohio, 3 hours and 29 minutes to travel from Cumberland to Washington; but a pigeon from my loft, several years ago, flew practically the same distance through the air in one hour and 54 minutes. Yet this pigeon did not win his race, because birds from other lofts made even better time!

XUM

Photograph by Clifton Adams

THE LUNCHEON HOUR IN LAFAYETTE SQUARE, WASHINGTON, D. C.

In this famous congregating center for the Capital's pigeon population, children with their nurses vie with retired admirals of the Navy and generals of the Army for the attention of these trusting birds. Their tameness and iridescent colors make these pets generally beloved.

The sport of racing pigeons was revolutionized coincidently with the revolution in transportation, beginning in the early days of the nineteenth century with the progress, first, of the steamboat, then of the railroad, and still later of the airplane. Where formerly pigeons were raced only short distances—from 10 to 30 miles—they are now flown from 500 to 1,000 miles.

Until about twenty years ago, Racing-Pigeon breeders believed that their birds would fly to a fixed loft only, and that if either the loft or the birds were moved, flying days were over. During the Russo-Japanese War, however, the pigeon service of the Japanese Army used mobile lofts, which kept pace with the troops; and the same was done in the World War.

The discovery of the mobile loft resulted from a very simple observation. A Japanese officer had noticed that practically all sailing craft in the Orient had pigeons on them and that the birds, if released in the morning, would return to their own ship later in the day, irrespective of the distance it had traveled. He therefore experimented with racing birds in movable land lofts and found that they would do the same on land as at sea.

PIGEONS PERFORMED BRILLIANTLY DURING WORLD WAR

Pigeons are naturally much afraid of gunfire; yet, for sheer grit, brilliancy of performance, and consistency in results accomplished, their work in the recent world conflict was astonishing.

The first extensive use of birds in battle by the American Expeditionary Forces, according to data compiled by the U. S. War Department, was during the Aisne-

Photograph by Clifton Adams

BEAUTY AND THE BIRD

If one is quiet and approachable, few of the birds in Lafayette Square, Washington, will hesitate to inspect a visitor closely and to accept from hand or mouth a dainty morsel of food. They are vegetarians and eat fruit, grain, and seeds.

Marne offensive, when mobile lofts were used. Due to the rapid advance of the American troops, the front line was constantly changing, yet the Army reports show that of 72 birds used during this action not a single one failed to return with its message bearing on the military situation during the advance! A total of 78 vitally important messages was carried by these birds.

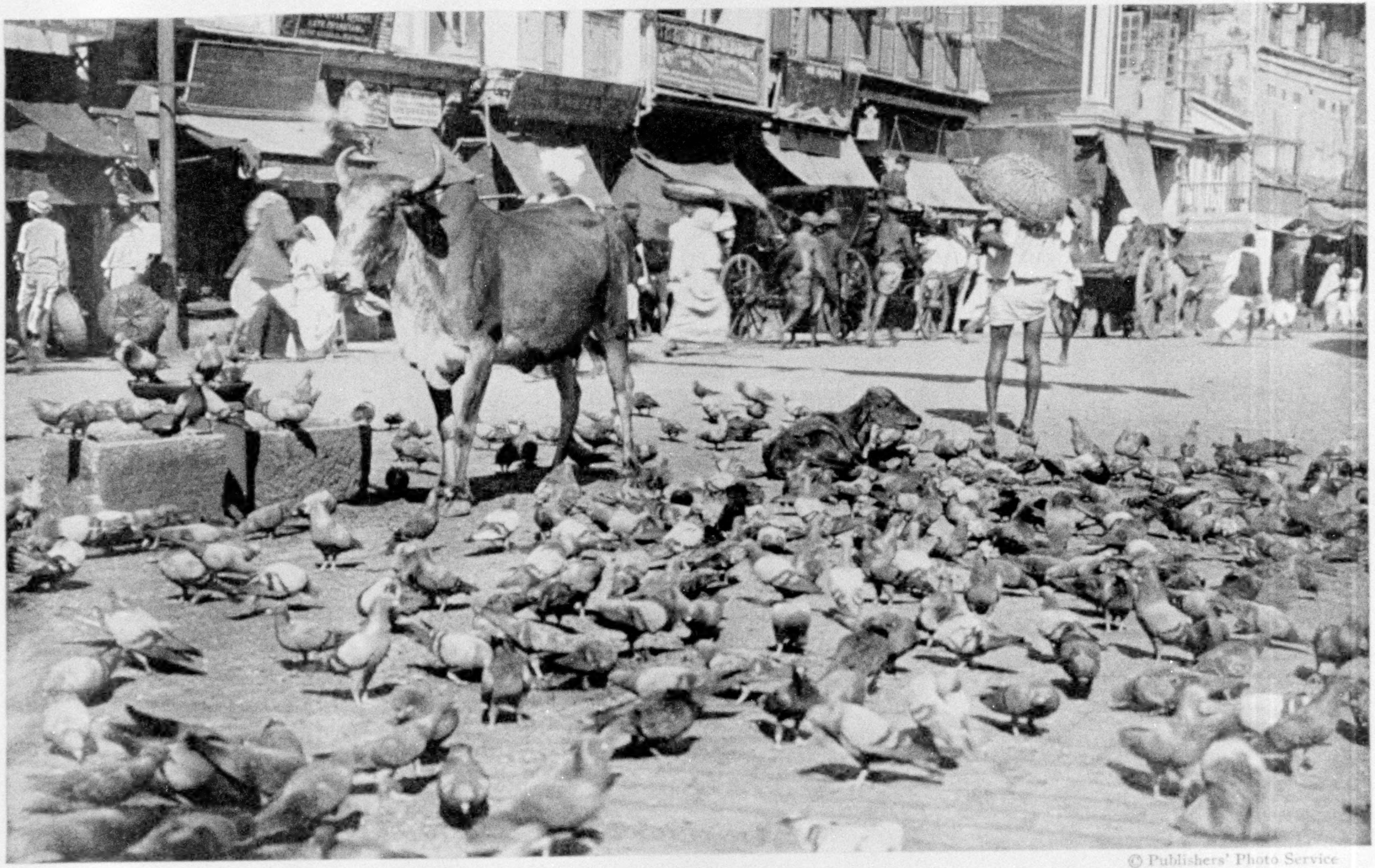
When one stops to consider that pigeons were used only under the most extraordinary conditions, when it was impossible to employ any other form of communication, this record of accomplishment needs no further comment.

In the Saint-Mihiel drive, notwithstanding fog and rain, constant use of gas, artillery, shrapnel, and machine guns, 90 important messages were delivered by pigeons from the front line of the American Army to the General Headquarters. In this offensive, 24 out of 202 birds used in the tanks were either lost or killed in action, but not a single message failed of delivery, as the precaution was taken to send messages in duplicate by two birds.

The speed of these birds averaged a kilometer a minute, despite flying conditions that were the worst imaginable.

When the Meuse-Argonne offensive was determined upon, only five days were allowed for the training and settling of Homing Pigeons in their mobile lofts; yet the 442 American birds used delivered 403 messages safely, and the distance flown constantly changed with the advance of the American troops, varying from 12 to 30 miles. The Army estimates that less than 10 per cent of the birds were lost or failed to return to their lofts by reason of the short period of training!

The outstanding fact to be noted is that not a single important message entrusted to pigeons in this vital action went astray or fell into the hands of the enemy.



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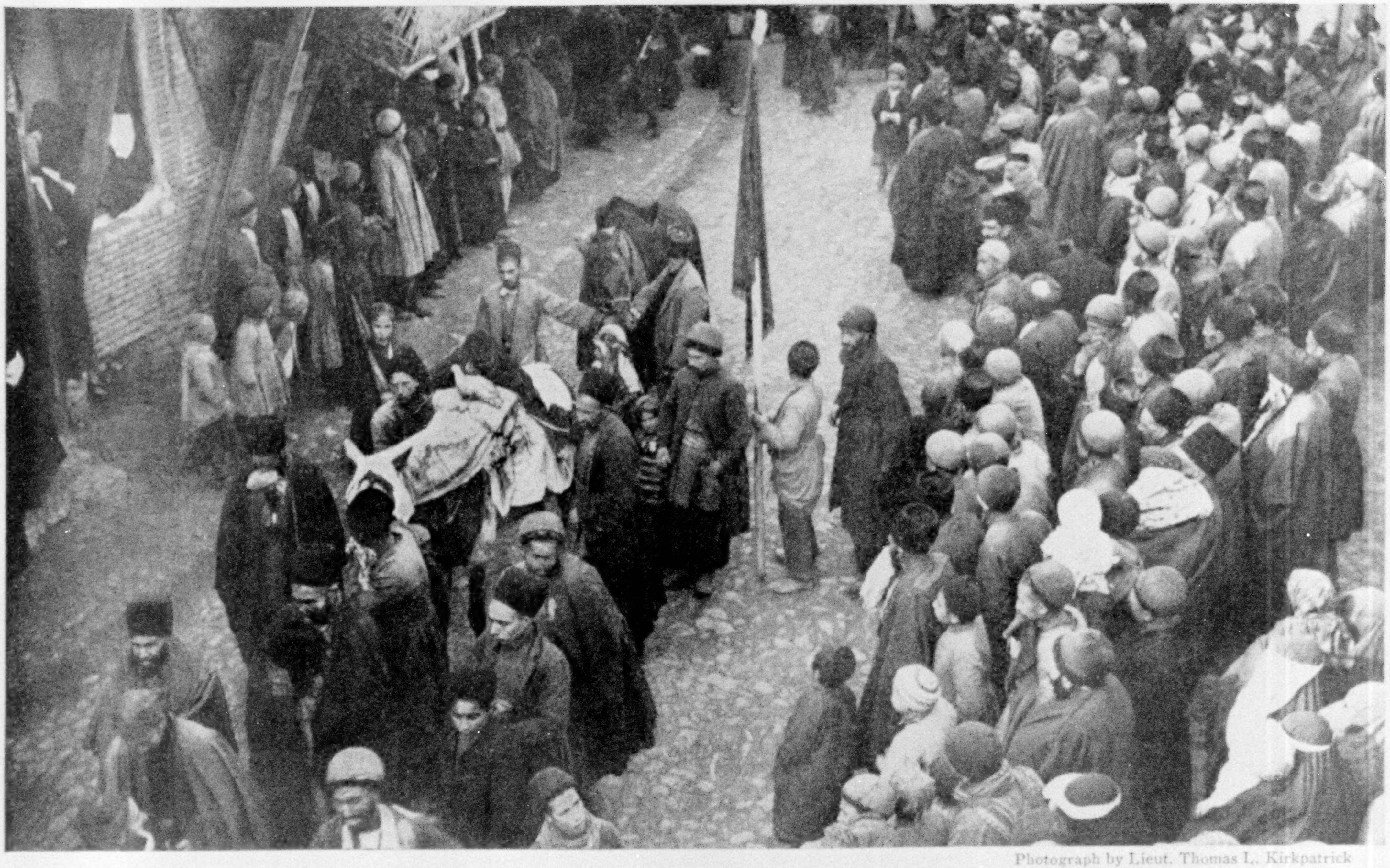
BEASTS AND BIRDS IN BENARES

In the sacred city of the Hindus the god Siva's holy cows and humped bulls walk in leisurely fashion about the streets without molestation. Here, too as in other public squares in various parts of the world, pigeons delight the eye of natives and of foreign visitors.



Photograph by Lieut. Thomas L. Kirkpatrick

A WHITE PIGEON TAKES PART IN A MOURNING PROCESSION: PERSIA

The Moharram, first month of the solar year, is sacred to Shia Mohammedans, who dedicate the first ten days as a period of mourning. Street processions and Persian passion plays increase the religious fervor of the zealous natives. Mohammed claimed that the dove, which he taught to perch on his shoulder and to pick seeds from his ear, imparted to him the counsels of Allah.

Official Photograph, U. S. Navy

RELEASING A PIGEON FROM A NAVY PLANE DURING FLIGHT

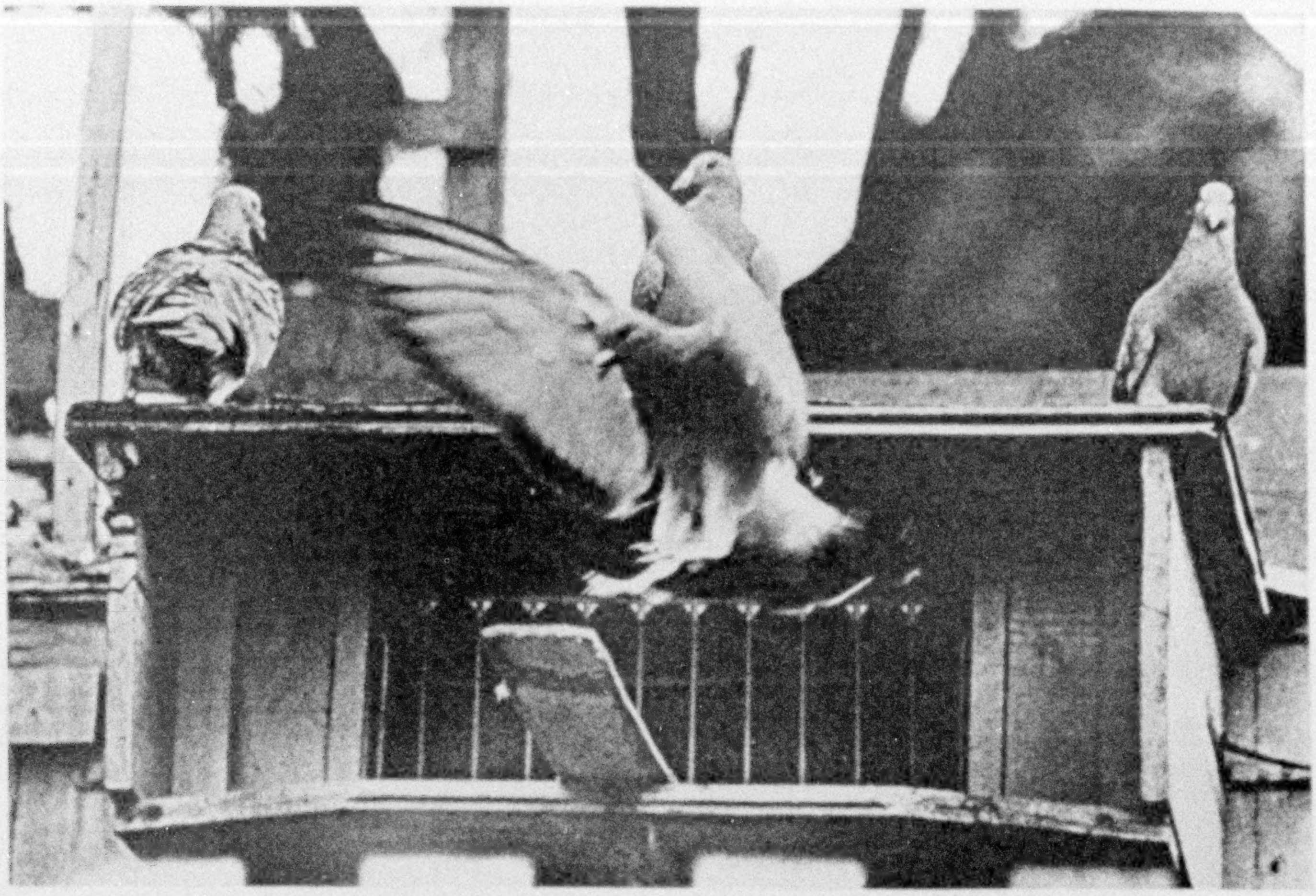
The Navy birds taken to the Arctic by the MacMillan Arctic Expedition (see the NATIONAL GEOGRAPHIC MAGAZINE for November, 1925) were especially selected and trained for their arduous work in the Far North. A special loft was constructed for their use and a large quantity of pigeon feed was provided. Unfortunately, all but four of these birds were killed by Arctic falcons during their first flight in Greenland.

Preëminent among the work of the birds was that performed by "Big Tom." Released at Grandpré at 2:35 one afternoon, this bird had to make his flight during intense machine-gun and artillery action; yet 25 minutes later he delivered his important message at a village 24 miles away!

When examined, it was found that one of the bird's legs had been shot away and a part of his breast ripped open by a machine-gun bullet, which was still lodged there. The message tube, intact, was hanging by the ligaments of the torn leg.

"The Mocker" (see illustration, page 92) was hit by a machine-gun bullet which destroyed one eye; yet he homed in record time on the morning of September 12, 1918, carrying with him a message giving the location of several heavy German batteries which, at that time, were doing terrible execution on advancing American troops. This information thus conveyed enabled the American artillery to silence the enemy's guns within 20 minutes.

"The Spike," another Homing Pigeon, was more fortunate than "Big Tom" and "The Mocker." During American offensives he made 52 trips from the front



Pacific and Atlantic Photograph

"BILL," OF ATLANTA, WINS AN AËRIAL DERBY

A bird is not considered "home" until it passes through the window of its loft, when the owner removes the leg band and puts it into an automatic clock to record the time of arrival (see text, page 94). Racing Pigeons are flown successfully from distances of from 10 to 1,000 miles, and a good average speed for one of these birds is 1,200 yards a minute (see text, page 86).

lines to his loft without being touched, and every one of the messages which he carried contained vital information.

"President Wilson" was a bird used at first by the Tank Corps, but was later transferred to the Meuse-Argonne sector. Like "The Spike," he made many important trips from the front to headquarters.

On the morning of November 5, when the situation in his sector was desperate, he was released with a message, the delivery of which probably meant success or failure to his command. There was a heavy fog at the time, and in addition to the difficulty of flying through it, constant artillery and machine-gun fire had to be encountered on the way home. This bird lost one leg in flight, but he brought the message through, after which he was sent to the hospital for treatment.

The French and the British during the war decorated some of their birds, but the American pigeons could not receive medals of honor or distinction because Congress had not authorized an award for heroism to any but human beings. The accomplishments of pigeons on land were equaled by those of pigeons at sea. Every Allied aviator carried these messengers with him.

The British, French, and Belgian governments commandeered the services of every Homing Pigeon in their respective countries. Even the Royal loft was taken over by the British Navy, and the king's birds were assigned to trawlers, scout ships, and other craft in the North Sea, from which they carried many important messages to Sandringham.

RACING PIGEONS TRAIN EARLY FOR THE RACE COURSE

Racing Pigeons have pedigrees like racing horses, and they are bred and trained with care equal to that bestowed upon their equine brothers. The enthusiast watches the feeding of his young birds from the moment they leave the shell. Four weeks later, when they leave the nest, fully feathered, he takes particular

International Newsreel

A FEATHERED HERO OF THE WORLD WAR

"The Mocker," a U. S. Army Homing Pigeon, whose eye was shot out by shrapnel during the European conflict (see text, page 90).

care to see that they do not go hungry while their parents are weaning them.

After they are weaned, the birds are placed in a separate loft, where they soon learn to know that the approach of their owner means food, water, or kindly attention of some sort. From the young bird loft they are given their first flying experience.

A Racing-Pigeon loft is equipped with a window made of wires which are easily pushed in, but not out. These permit the bird to enter the loft, but prevent his exit. Outside of the window is a landing board, on which the birds alight when returning from a spin through the air.

After the youngster is happily settled in his loft, his first experience outside comes some morning when his owner, before feeding him, places him on the landing board. Food is then scattered on the loft floor, and the "young man," before he realizes what he has done, pushes a wire to one side and comes in for his breakfast.

THREE LIDS PROTECT THE PIGEON'S EYES

After two or three repetitions of this first lesson, the bird wakes up some morning to find that the window has been removed during the night. Out he goes and up into the air, but before long, ere he becomes tired, he hears the familiar call for breakfast. Down he comes in a hurry, scampering over and among his comrades, as all try to get inside at once. For several weeks he makes these early-morning turns in the air; then in the evening.

When the bird is from nine to twelve weeks old his hard work begins, preceded by a careful physical examination. The head is examined first. It should be strong and powerful in appearance, with plenty of room between the eyes for a keen brain. The eyes, covered by three lids, should be prominent and bright and should look straight ahead. When flying conditions are normal, all lids are open, but in bad weather the bird can close one or two lids and continue flight with protection to the eyes.

The wings are the most essential part of a Homing Pigeon's body. When these are spread, the feathers should overlap

Official Photograph, U. S. Navy

A WINGED MESSENGER IS CAST OFF FROM A NAVY PLANE

At the time of the World War armistice the forces of the United States and Allied armies had approximately 320,000 pigeons for use in emergencies as a means of communication when all other methods failed.

each other without any breaks. Good length and breadth of feather are desirable, and at full spread the wing should look like an inverted letter V.

Each wing contains twenty feathers, ten primary at the outer edge and ten secondary on the inner side toward the body.

The Homing Pigeon's tail, which is its rudder, is also important. It has twelve flight feathers in two sets of six each. When the bird is at the top of its flight, the tail has the appearance of containing but one feather.

Pigeon flyers watch the molt, or changing of feathers, closely. When a bird is six weeks old it begins to drop its nest feathers and its first set of adult feathers begins to appear. It should never be flown while in heavy molt.

The new feathers, if food and housing conditions are satisfactory, will all be in within eight or ten weeks from the start of the molt. When the molt is sufficiently advanced, the youngster's training on the road begins.

After the birds grow familiar with their surroundings they are taken a mile or more from home in a basket and released. The distance is increased from day to day up to 25 miles. When this stage is reached, instead of being released in a group from the basket, they should be single tossed—that is, one bird should be taken out at a time—and there should be a delay of two or three minutes before another bird is freed.

This single-tossing process, repeated many times, puts the individual bird on

Official Photograph, U. S. Navy

PIGEONS WITH MESSAGES ARRIVING AT THE ANACOSTIA NAVAL AIR STATION
(SEE, ALSO, ILLUSTRATION, PAGE 91)

Racing Pigeon fanciers usually like to have what is called an "overflight" loft, or one at a greater distance than the average to be covered between starting point and home terminal, because a bird flies fastest when it is near home, and the overflight lofts, under normal conditions, usually produce the race-winners. But under bad conditions the short loft has the advantage. Its birds can better fight wind, rain, and darkness and may get home at the close of a hard day, whereas the birds from the overflight lofts may have to wait until the next morning.

his mettle. It also trains him to fly from a given point to a given point, notwithstanding the number of birds in a flock at the time he is released in a race, or the number he may meet flying in an opposite direction.

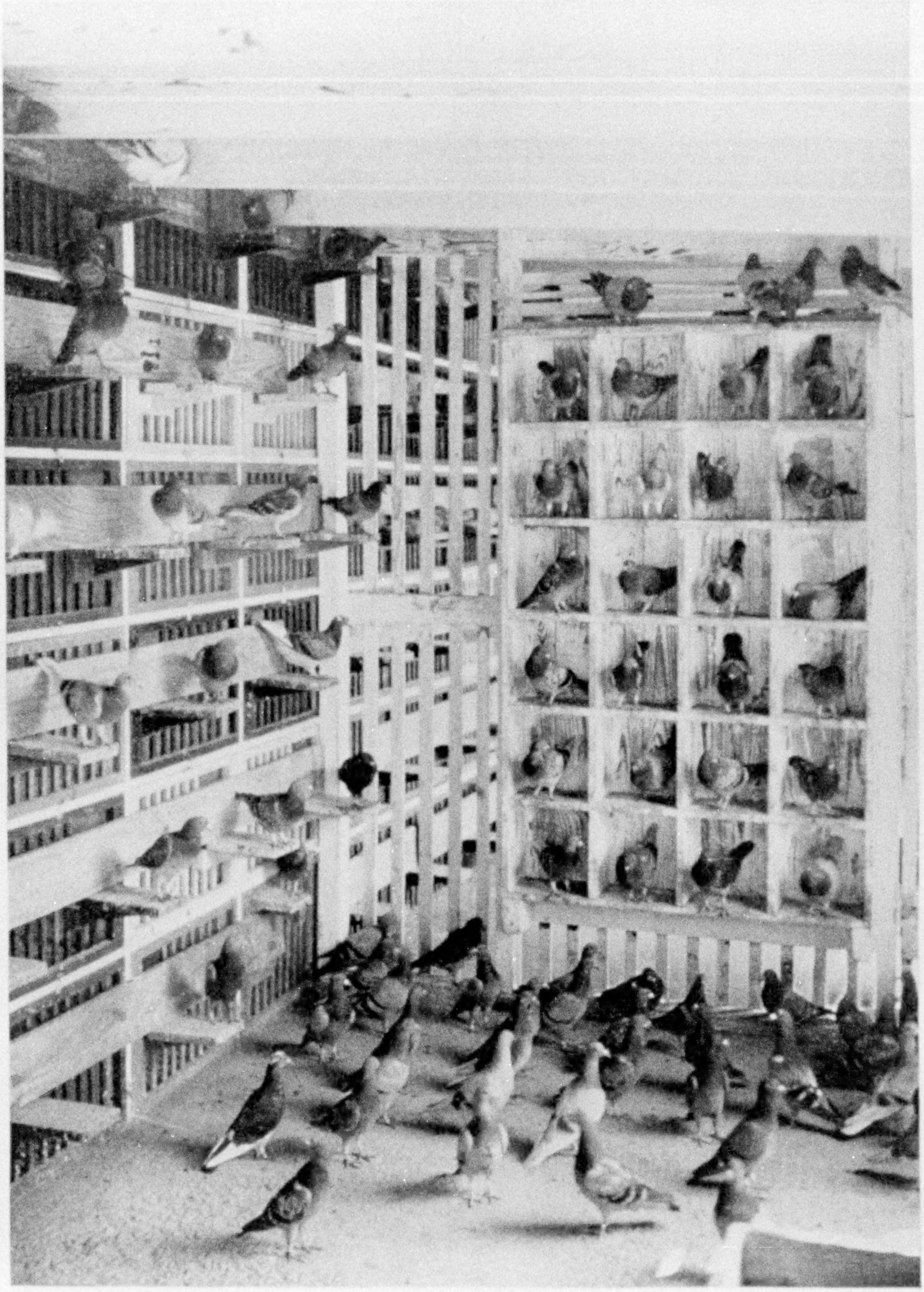
From the 25-mile stage a jump may be made to 50 miles, usually the last training stage for a young bird. The next step is ordinarily the 100-mile race, where the bird gets his first test for speed and endurance.

The racing of pigeons is unlike any other sport, in that the birds start from a given point, but finish at different points. When they are shipped to the race, a countermark, or small band, with a secret number, is placed on the leg of each contestant. When the bird reaches its home, it should go into the loft without delay, where its owner removes this band and puts it into an automatic clock, which records the time of arrival (see, also, p. 91).

The distance to each loft from the starting point is measured, and the winner of the race is the bird which flies the greatest number of yards per minute.

PARENTAL INSTINCT PLAYS PART IN RACING

When old birds are raced, the hen flies best when her eggs are from eight to ten days old, and the cock when their young are from ten to twelve days old. While the cock is driving his hen, neither bird can be raced successfully, as the spirit of



Official Photograph, U. S. Navy

CONTENTED INMATES OF A LOFT AT THE NAVAL AIR STATION, ANACOSTIA, D. C.

In the loft each pair of pigeons has its individual nesting compartment, as shown on the left, where the male assumes the family duties during the day and the female from late afternoon to mid morning. There should also be perches or stalls for those off home duty, as on the right. The proprietary instinct is strong in pigeons, and once a nest or perch is taken by a male, he will defend it against intruders and, if assistance be needed, his mate will join in the defense.

Photograph from Keystone View Company

BOSTON'S PIGEON MAN

This is a familiar sight on Boston Common every morning at 9 o'clock, where this bird lover has fed the pigeons every day for 10 years. They gather by the thousands and wait for him.

love-making is all-engrossing. It is also inadvisable to fly either a male or female for several days after the eggs come, as the birds do not settle down immediately after the hen lays.

On the longer courses pigeons usually terminate their race during the evening, so the female with eggs is anxious to get home to her nest and flies hardest to get there. If there are youngsters to be given their evening meal, the male bird strains every muscle and nerve to see that they do not go hungry over night.

On clear, quiet days pigeons fly high in the air, almost out of sight; when wind, rain, fog and clouds are against them, they fly close to the ground to take advantage of any chance shelter.

In well-bred pigeons the instinct for home is so strong that birds sold to other cities have been known to return to their old lofts upon being released several years later. Some of mine have returned from North Carolina to Washington six months after being shipped south. Others, which were never trained on the road, but were reserved for breeding, have returned to their homes after being shipped to distant points.

On the other hand, fine Racing Pigeons have been made so happy in their new homes that they could be settled and flown from them with complete success.

Pigeons will fly in any month of the year, but the old birds' racing season coincides with the period during which their owners allow them to breed—from March to July (see, also, text, page 77).

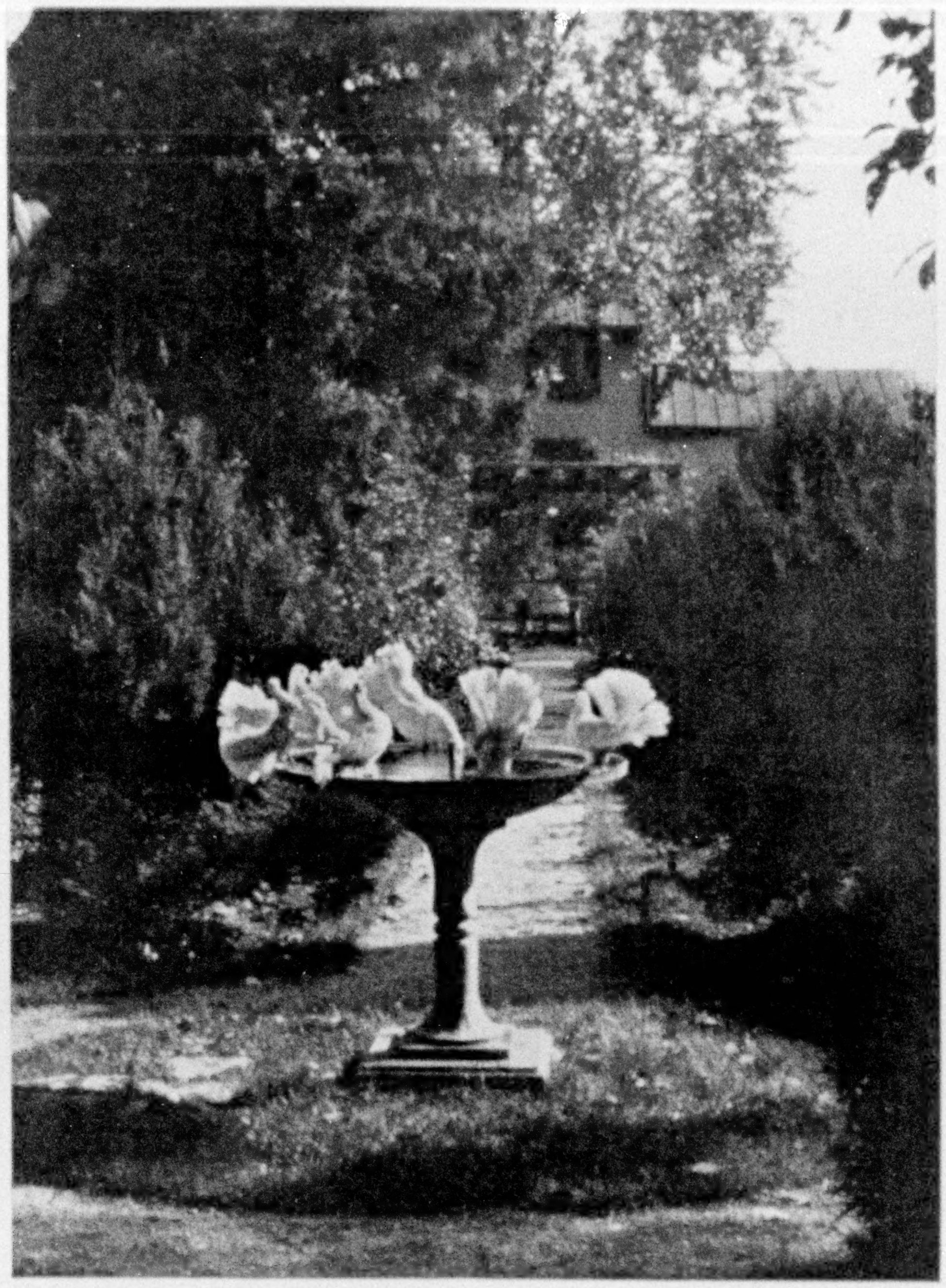
ORCHIDS OF THE BIRD KINGDOM SCATTERED FROM DUNDEE

"They came in a ship to Dundee." That brief sentence sums up the entry into Anglo-Saxon countries of many of the most beautiful birds in the whole realm of the fancy-pigeon world. From Calcutta, Bagdad, Hongkong, Archangel, Bokhara, Constantinople, Asia Minor, and the Barbary Coast, these orchids of the bird kingdom reached Dundee. From there they were distributed throughout the British Empire and America.

Notwithstanding man's love of pigeons, little is known of the origin of many highly treasured varieties. In London, as long ago as 1676, the ornithologist Willughby published in Latin a treatise on pigeons. Two years later he translated it into English.

Sixty years later John Moore, a London apothecary and celebrated worm doctor, wrote a history of tame pigeons, and his descriptions of ideal birds, penned nearly 200 years ago, would fit well into our standards of to-day, although such tremendous strides in breeding have been accomplished since that time that the birds of his day would not be recognized by their present descendants.

The Carrier, the Tumbler, the Pouter, the Barb, the Fantail, the Runt, the Jacobin, and the Nun, all prized varieties of to-day, were favorites with Englishmen in the time of Willughby and Moore. Yet none of these birds originated in England. Pigeon clubs and columbarian societies flourished then, and many importations from the Orient were first seen at the meetings of these clubs.



Photograph by Gilbert Grosvenor

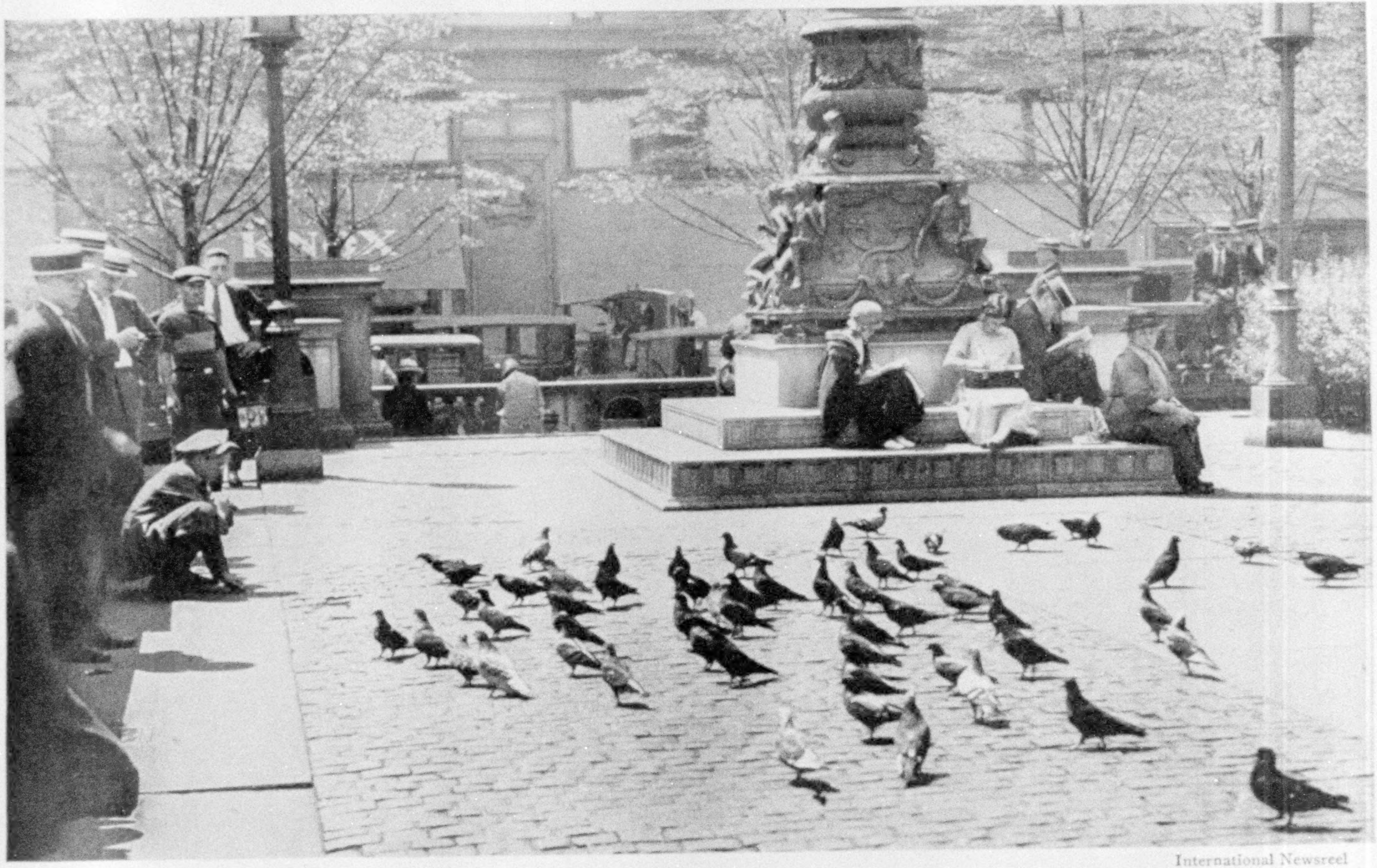
PIGEONS DECORATING THE GARDEN OF DR. EDWIN A. GROSVENOR, OF AMHERST COLLEGE, MASSACHUSETTS

The Fantail is a bird of curves, distinguished by an enormous fan-shaped tail. Its beauty, grace, and spirit long ago won the affection of hosts of fanciers. It originated in Hindustan from unknown stock and arrived in Europe via "a ship to Dundee" (see, also, text, below).

THE FANTAIL HAILS FROM HINDUSTAN

Of the ancestry of the Carrier, the Pouter, and the Tumbler we know little. The Fantail originated in Hindustan. But even as late as 75 years ago a shipment of these graceful little dancers, arriving in Dundee, completely revolutionized the Fantail fancy and started a war between Scotch and English breeders which ended only upon the outbreak of the World War. The English first saw the birds in the showroom, where they were exhibited by their Scotch competitors. From that moment the battle of styles was on.

The Fantail is a small, round-bodied bird which carries an enormous fan-shaped tail frequently having more than 30 feathers (see Color Plate III). As it



International Newsreel

THE PIGEONS' HOUR AT THE NEW YORK PUBLIC LIBRARY

Every day at noon hundreds of pigeons gather in front of the Public Library, at Fifth Avenue and 42d Street, and the 12-o'clock loungers on the benches throw them stray crumbs from their luncheons. The close of the noon hour sees the flocks of birds winging their way to nests and nooks in the neighborhood.

stands on its toes and holds its tail erect, the bird's chest, and not the head, should be directly over the feet. The neck is long and fine, curved down and backward, and the head rests on a cushion at the base of the tail. When viewed from the front, the head cannot be seen.

In other words, the Fantail is a bird of curves, whether one looks at the beautiful, circular tail, whose ends almost meet at the bottom, or at the body. When moving about the loft, it fairly quivers with excitement and dances blithely on its way about its business.

This description would have fitted Willughby's and Moore's ideal of a Fantail, which in those days was also called the "Broad-tailed Shaker." But English breeders for a number of years concentrated on tail quality and forgot other properties. The result was that they produced birds with perfectly enormous tails, but coarse in all other respects.

Then another ship came to Dundee, and on it were Fantails with small, round bodies and fairly large tails. The Scotch fanciers at once began to ignore everything but body conformation, and the English everything but tails.

Meanwhile the Fantail established itself in America, where fanciers were quick to see that the ideal bird combined the good qualities of both a small body and a large tail. To-day this country has many glorious Fantails with bodies even smaller than the old Scotch ideal and carrying large circular tails.

THE BARB IS A NATIVE OF NORTHERN AFRICA

The Barb (see Color Plate V), a pigeon beloved by Shakespeare and by Mary, Queen of Scots, who pined for it while in prison, is rarer to-day than 300 years ago. It originated in northern Africa so long ago that all traces of its early history have been lost.

It is a small bird of the toy variety and is the only square-headed pigeon known. It has a short, stout beak, like that of a bullfinch, and is also distinguished by an eye cere, or wattle, which covers almost the whole side of its head. As the bird grows older, another heavy wattle appears on the upper and lower parts of its beak.

The usual colors in Barbs are beetle-green black, red, and yellow. The wattle, being of a flesh color, forms a pleasing contrast against the body color.

THE CARRIER, KING OF PIGEONS, LOOKS FOR BATTLE

The Carrier (see Color Plate V) has for centuries been regarded as the king of pigeons. It is a large, bold bird, which probably got its name from its aggressive carriage and not from its flying ability. Like the Barb, it has both an exaggerated eye and nose wattle. The latter is so large that when the bird is fully matured, at three or four years, it has the appearance of having shoved its beak through a beautiful white rosebud.

The Carrier is the most quarrelsome of pigeons and will fight upon the slightest provocation. When he cannot find anyone else to quarrel with he may beat his wife. For this reason Carriers are usually bred in individual compartments, for in their constant conflicts they are apt to ruin their rose adornments, their chief claim to favor.

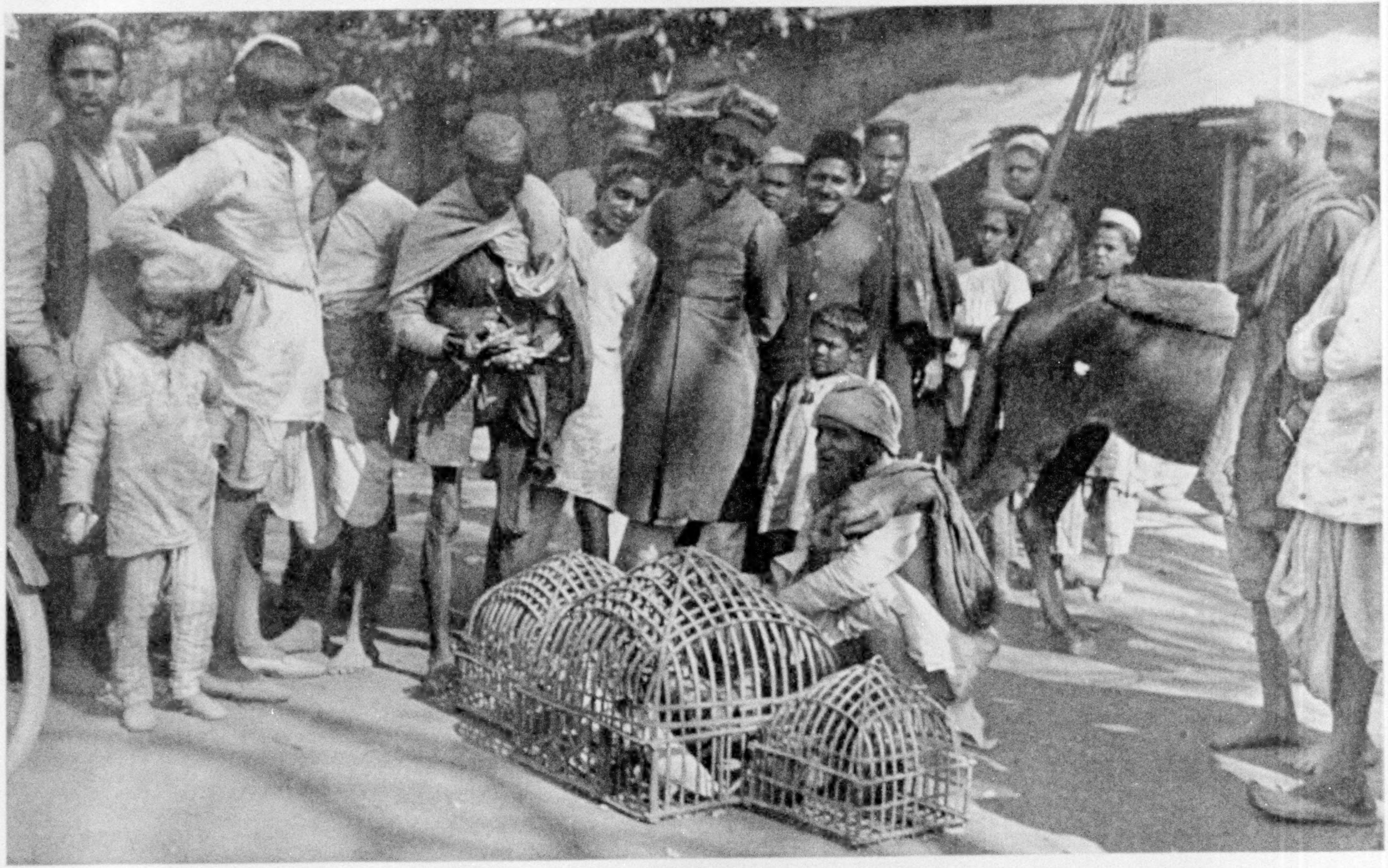
Of later origin than the Carrier is the Dragoon (see Color Plate V), a noble-looking bird with a bold head and eye. The Dragoon has well-developed eye and nose wattles, but they are not so large as those of the Carrier.

Another bird of like type, the Horseman, was much fancied centuries ago, but has now practically disappeared and its place given over to the Racing Homer.

Jacobins and Nuns, two very old varieties, wholly dissimilar in appearance, are shown in Color Plate IV. The Jacobin has a hood which, in finely developed specimens, makes it almost impossible to see the head. Nuns have only a small hood, called a "shell crest" in pigeon terminology.

The Jacobin comes in solid colors, such as red, yellow, and black, with a white tail and white flight feathers on the wings. The Nun has a pure-white body and crest, with colored head, tail, and flight feathers. Nuns come in several colors, but black is most favored.

Queen Victoria of England kept many varieties of pigeons, but her favorites were the Jacobins (see also text, page 64), and many a prize winner ultimately found its way into the Royal lofts, from



THE LUCKNOW DOVE-SELLER DOES NOT LACK CUSTOMERS: INDIA

The "orchids of the bird kingdom" originated in the Orient, but there, as elsewhere, the more humble types are still popular.

which in turn its offspring went back into the showroom and out into the fancy. Elizabeth Barrett Browning was another pigeon fancier who frequently urged her friends to take up her hobby and share her pleasures. A proof of her friendship was a gift of a pair of her favorite pigeons.

THE POUTER IS THE ARISTOCRAT AND BUFFOON OF PIGEONS

The Pouter (see Color Plate VI) is not only the aristocrat but also the buffoon among pigeons. There are eight or ten varieties of pouting pigeons, but two, the English Pouter and the Pigmy Pouter, have outstripped all others in popularity.

The former is a tall, thin-waisted bird, some 18 inches in length, and stands on long, thin, storklike legs completely covered by stockings of feathers. He resembles a man wearing a full-dress coat with close-fitting white satin breeches and white spats. At his throat there is a crescent of white like an old-fashioned cravat. The wings are often colored black, red, yellow, and blue, with rosettes of white splashed on each shoulder.

There are also pure-white Pouters, but only during the last few years have they approached the colored birds in perfection of type.

The name of this variety comes from an ability to inflate its neck into a large circular globe, which, in poor specimens, is most grotesque, but in good ones exceedingly attractive. The name has no bearing on the bird's personality, for the Pouter is a jovial chap, who can assume instantly an air of solemnity and dignity. He is never out of sorts, and if shown the slightest attention will strut and blow for all he is worth.

As may be expected, such a fellow is not a good husband or father, and a Pouter cock is always ready to neglect his home duties to go philandering. Consequently, Pouter fanciers must maintain a loft of auxiliary parents in order to insure the rearing of the young.

The Pigmy Pouter is a miniature, in every respect, of the English Pouter. While the latter has been known for centuries, the Pigmy is a creation of the last century. Originally it came from continental Europe and was not related to the large English Pouter. During recent years, however, Pigmy breeders have outcrossed and inbred on the English Pouter, so that to-day the only difference between them is not one of type, but of size.

The Tumbler (see Color Plate IX) has more friends the world over than any other variety of fancy pigeon. Man's affection for it has lasted more than three centuries, although the prize Tumbler of 25 years ago is entirely different from the accepted type of to-day. If the old favorites of 1676 and 1736 should put in an appearance now, they would be driven out of the lofts of modern Tumbler fanciers as aliens.

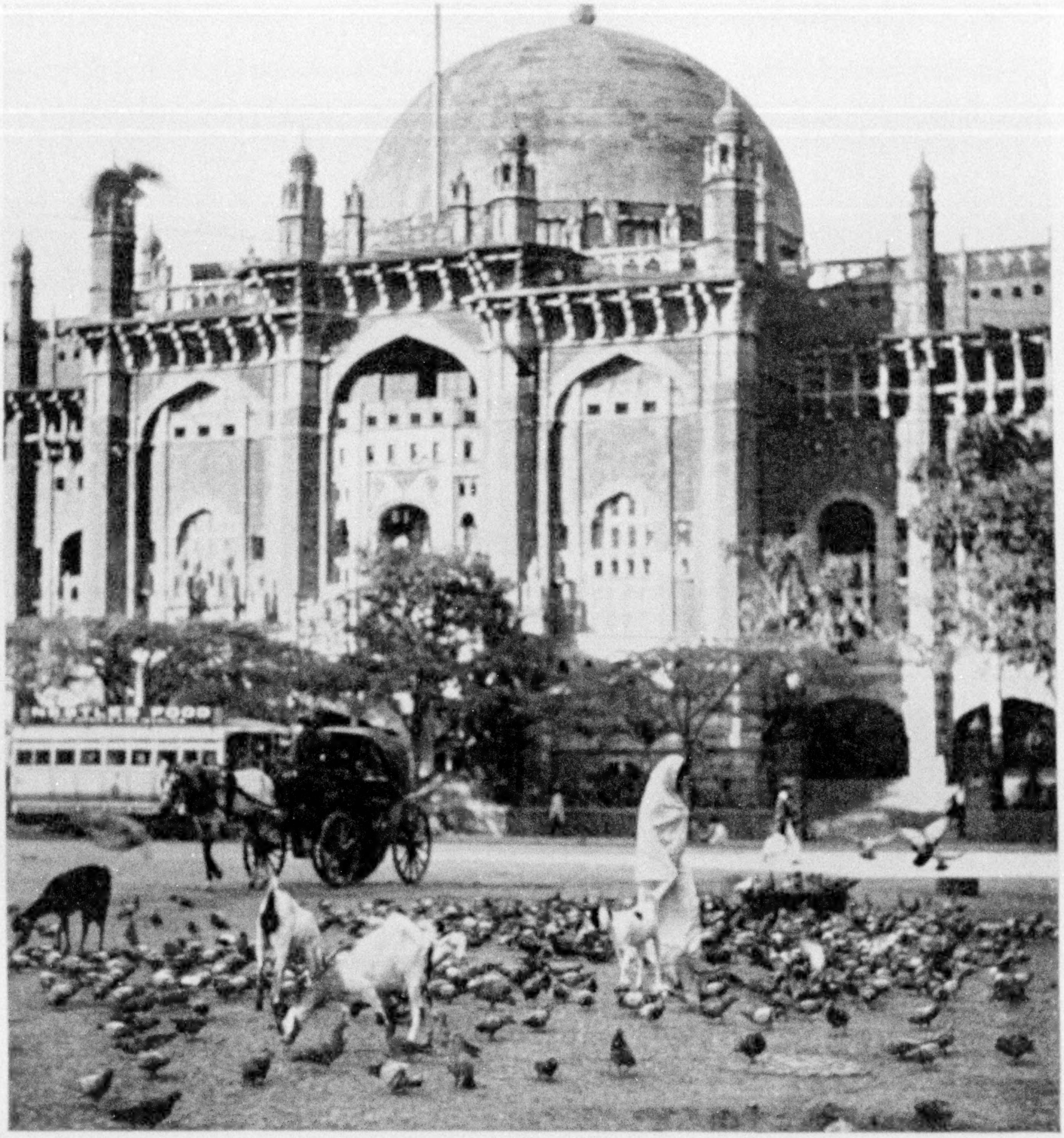
ANCESTORS OF THE TUMBLER WERE ACROBATS

This pigeon derives its name from the ability of its ancestors to turn somersaults while flying through the air. There are still Tumblers which perform, but they are not the ones seen in the showroom. The acrobats themselves are divided into many classes, some of which make but one turn at a time, others two or three, still others side dips, and yet others which fly high in the air and descend (sometimes to an untimely death) by a series of backward revolutions.

In addition, there are Parlor Tumblers and Parlor Rollers, which cannot fly at all, but perform on the ground. The single and double Tumblers can be trained to stand perfectly still until a signal is given, upon which they will make their turn, come to attention, and wait for the next signal before turning again. The Parlor Rollers turn a series of backward somersaults along the ground. Those that roll the farthest are the best.

The Hindus originated the performing Tumbler, and in addition to the varieties known in this country, they have another, called the Lowtan, which will not perform until it is shaken up rather roughly several times in the hand.

The old-fashioned Tumbler was a plain-headed sort, but the modern bird has a large, broad, bulging forehead, the broader the better, and the beak should be set on at an almost direct right angle to the head. All other things being equal, the Tumbler with the best head wins to-day.



Photograph by Maynard Owen Williams

PIGEONS FEEDING BEFORE THE POST OFFICE IN BOMBAY

Mohammedan reverence for these birds is so great that two European boys nearly provoked a riot in Bombay recently by ignorantly killing some street pigeons. The stock exchange and general market closed and workmen threatened a widespread strike. In remote parts of the Mohammedan world the birds have almost come to be worshiped, and at the pigeon shrine of Kaptar Mazzar, in Chinese Turkestan, good Moslems are supposed to dismount and approach the spot reverently.

Tumblers are known as clean-legged and muffed. The former have no feathers on their feet; the latter have a profusion of feathers, and the longer and more profuse they are, the better (see Color Plate IX).

Tumblers come in solid colors of red, white, blue, black, yellow, and silver. There are also birds with colored bodies and white wings, called "whitesides," and birds with mottling on the wings. One of the most fancied subvarieties is the "baldhead," which has a pure-white head, wing flights, and tail, with a colored body.

For many years the Almond, or short-faced Tumbler, was the most popular of these birds, but of late its vogue has declined. This pigeon, as its name implies, is of an almond color, interspersed with beetle-green black. By some it was called

TOM JOHNSON

© Underwood & Underwood

A PUBLIC SQUARE IN WHICH CLEVELAND PIGEONS GET THEIR MIDDAY MEAL

The statue is that of Tom Johnson, one-time mayor of the Ohio metropolis.

Ermine because of its color shading. During the seventeenth and eighteenth centuries in England, good Almond Tumblers frequently commanded as high a price as a good horse.

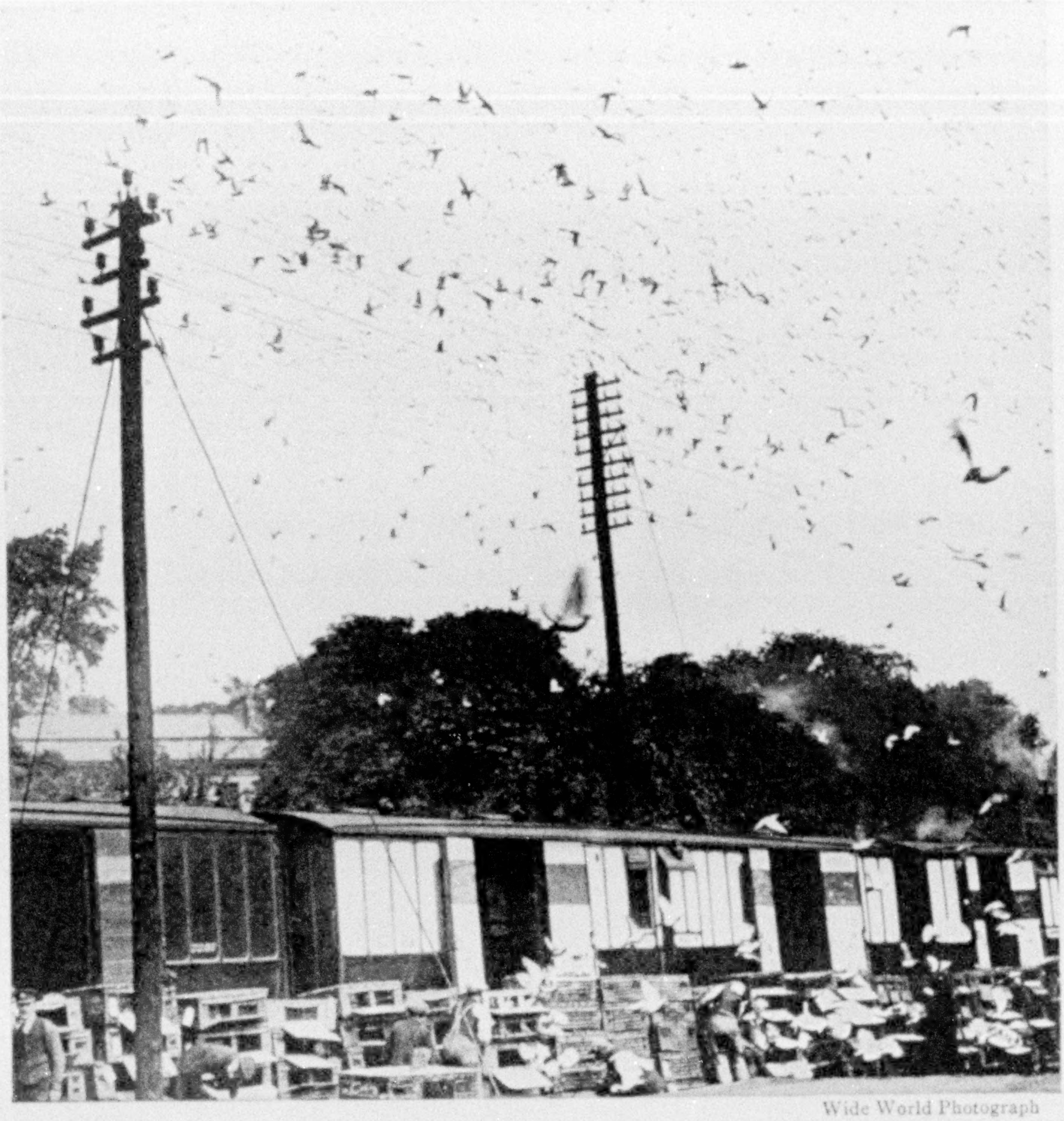
TUMBLERS TAUGHT AVIATORS TO LOOP THE LOOP

Pigeon fanciers believe that the pioneer aviators learned to do many of their stunts, such as side dips and looping the loop, from their observations of Tumbler pigeons in flight. The Tumbler and the airplane loop the loop in exactly the same fashion. Both point their noses upward and fly gradually toward a vertical position; when they reach it, both cut off all power, apparently, and, with wings outspread, turn over backward, catch themselves, and begin flying again.

Among pigeons, as among men, there are long-nosed and pug-nosed individuals. One of the most popular groups of fancy pigeons is made up of the "pug-noses," or so-called "short-faces," which includes the Turbits, Owls, and Oriental Frills among its favored members. Formerly they were unrelated, but during the last 50 years discriminating breeders have so crossed them upon one another that today, notwithstanding marked differences in color, structure, and feather properties, these birds may be grouped together.

The longest-nosed pigeon is the Scandaroon, which originated in Bagdad centuries ago. It is a large bird, with colored body and white wings, a long, Roman-curved beak, and a disposition compatible with its ferocious appearance. The Scandaroon still has many admirers, but its most valuable use has probably been in the crossing into other varieties where bold head appearance was lacking.

The Turbit is the oldest-known member of the short-faced family. He is a small bird with white body, wing flights,



Wide World Photograph

THE START OF A PIGEON DERBY IN GREAT BRITAIN

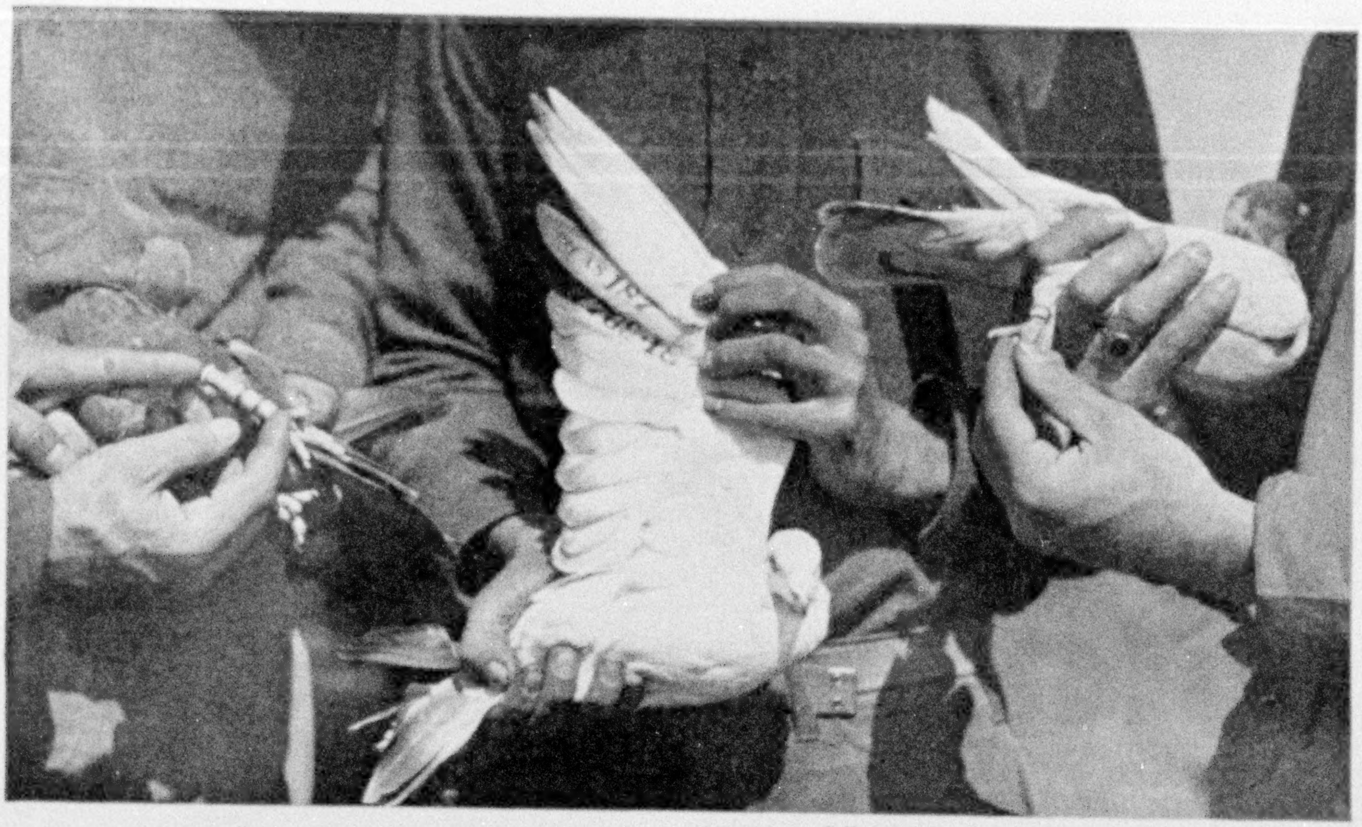
Five thousand birds have just been released from five railway cars. Although the first regular pigeon races did not begin in Great Britain until 1881, the birds have long enjoyed the affection of British fanciers. When the weather is clear and quiet, pigeons fly high, almost out of sight, but during wind, rain, and fog the birds stay close to the ground, to take advantage of any chance shelter (see, also, text, page 96).

and tail and colored shoulders. The favorite colors are black, blue, silver, red, and yellow.

The Turbit's outstanding feature is his head, which should be large and bold, with a bullfinch beak and a small peak crest. There should be an unbroken curve from the tip of the beak to the crest. The eyes, instead of being set in the middle of the head, are placed well forward. Down the breast is a roselike frill of feathers. The feet are free of feathers.

There are three varieties of Owls, so named for their resemblance to the nocturnal bird. They have no crests and their heads are more nearly round than the Turbits'. As in the case of the latter, the stouter their beaks, the more highly are they regarded. They come in solid colors and have no feathers on their feet.

The African Owl is the smallest, the English Owl the largest. The Chinese Owl, the rarest of these birds, is between the African and English in size and car-



Official Photograph, U. S. Army Air Service

THE ACCOUTERMENTS OF A PIGEON MESSENGER

Left, the capsule containing the message, which is attached to a leg of the bird; center, the loft and squadron numbers stenciled on the wing feathers; right, an identification marker.

ries a double rose frill on his breast, which in good specimens extends up around the neck on each side of the head. This group comes in standard colors and also in exquisite powdered blues and silvers, wherein they have been bred to greater color perfection than any other variety.

ORIENTAL FRILLS ARE PEERLESS BIRDS FROM ASIA MINOR

Oriental Frills (see Color Plate XI), regarded by their owners as gems of the Orient, were introduced into England about 75 years ago by H. P. Caridia, a former resident of Asia Minor. There this variety was originated hundreds of years ago and held sacred for centuries.

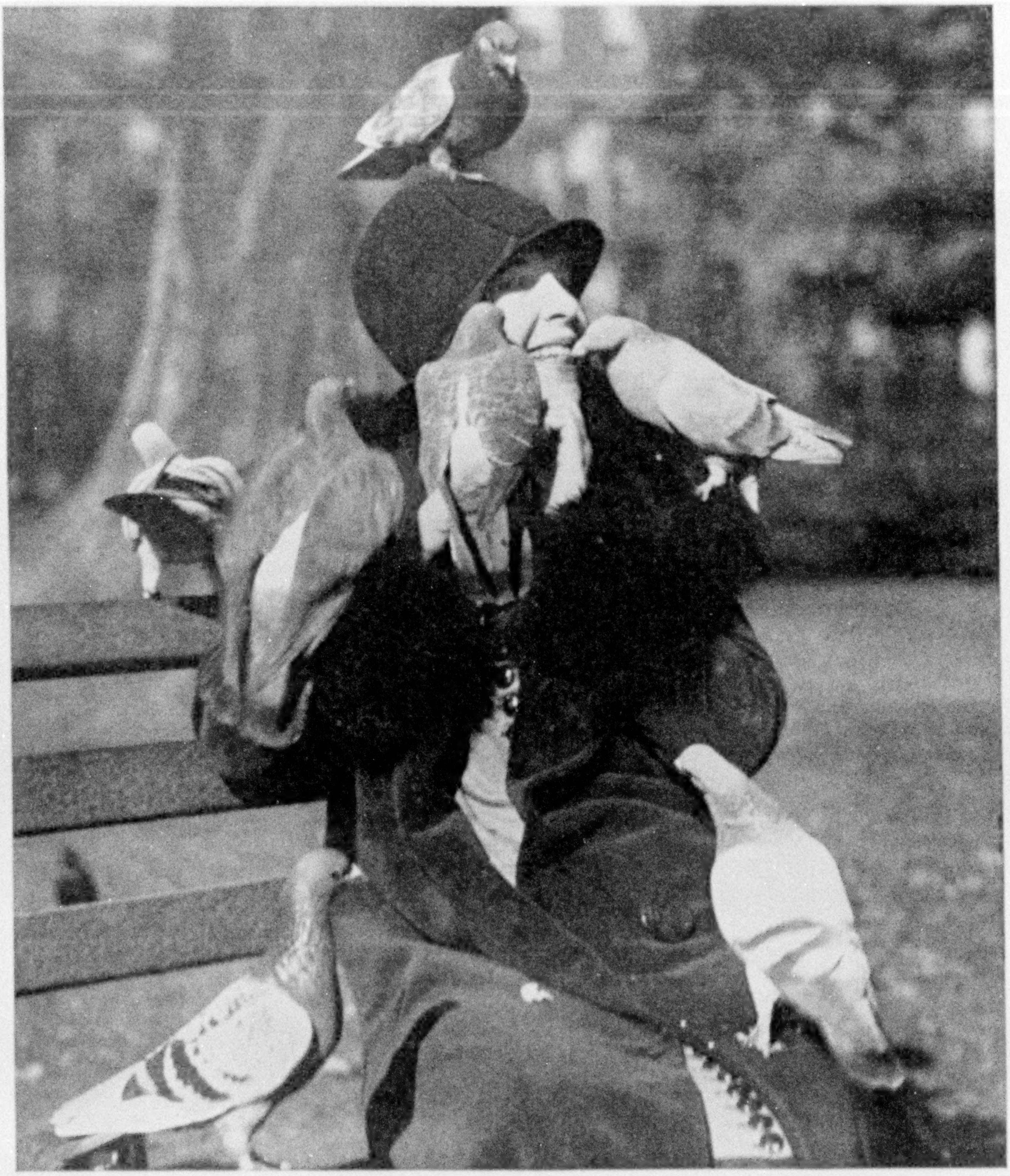
The Orientals have outstripped both the Turbit and the Owl in the race for popularity, and, without disparaging the others, appear to be entitled to the esteem they have won. In them the fancier has pigeons with at least three different shades of color on one feather; pigeons which come from the nest with one group of color tones and which assume an entirely new group on reaching maturity. The four subvarieties in greatest favor are the Satinette, the Blondinette, the Bluette, and the Silverette.

The Satinette has a white body with penciled or laced wings. The penciling may have the appearance of blue, black, dun, sulphur, or brown tracing, and the outspread wings resemble a fine piece of iridescent lacing. The blue-laced Satinettes have blue tails, with a white spot, or moon, near the tip of each feather. In the others the tails are laced like the wings.

The Blondinettes are colored or laced all over. The Bluettes and Silverettes have white bodies and blue or silver wings. A peculiarity of their marking is that the bars of their wings are white edged with pink and not black, as in other varieties.

The heads of Orientals should resemble those of Turbits, but the Turbit peak, although desired, is not required, and a good plain-headed specimen will defeat a poorer bird with a peak. The legs and feet are covered with short, thick feathers, resembling the stockinged feet of a grouse.

The coloring on Orientals is so rare that many fanciers of other varieties have tried to introduce it into their birds, but, so far as is known, without success. On the other hand, if Owl or Turbit blood is introduced into the Orientals, the structural properties sought therefrom have



Photograph by Clifton Adams

THEY ARE ALWAYS HUNGRY

The gentleness of these birds makes the Dove (or Pigeon) an appropriate symbol of peace in Christian lands. The Japanese, on the contrary, consider it a messenger of war.

been obtained and the pure Oriental coloring regained in full within a few generations.

TALKING PIGEONS

There is an old story down South about a darky who was told to clean up a pigeon loft. A few seconds later he emerged, pale in color, his eyes bulging, and swore he would never go back. "'Deed, Boss, dem pigeons talks too much fo' me! De minute Ah went in dey begin sayin', 'Look at de coon; look at de coon; look at de coon,' and Ah never could stan' no one lookin' or talkin' at me when Ah's a workin'!"

The Russian or Bokhara Trumpeter is the greatest talker among pigeons. He is a heavy, booted fellow, with a rose crest, and, while busy about the loft, sounds like

© Keystone View Company

TWO GOLD STAR MOTHER PIGEONS WHOSE CHILDREN NEVER CAME BACK FROM THE WAR

These birds were also couriers during the European conflict and might properly wear service stripes as well as stars. They, like many other Homing Pigeons, were entrusted with vital messages which they carried successfully throughout artillery barrage and machine-gun fire from the front-line trenches to headquarters during history-making offensives (see text, pages 86, 87, 91, and 92).

a trumpeter at practice with a low-pitched horn. There is another variety, now almost extinct, called the Laugher, whose cooing resembles a human chuckle.

SHORT-FACED PIGEONS REQUIRE "WET NURSES"

It is impossible to describe all the varieties of fancy pigeons seen at shows. There is, for example, the great class of German toys, with more than twenty subvarieties, including Swallows (see Color Plate X), Frill Backs (whose feathers grow the reverse of those of all other birds), Helmets (see Color Plate IV), and Priests. There are the Magpies (see Color Plate XII), beautiful birds with wild magpie coloring, only richer; the Hungarians, parti-colored birds bred for centuries; the Mookees, Snabians, Sherajees, Chinese Dewlaps, Starlings, Modenas (said to come in sixty or more colors), and numerous others.

Fancy pigeons mate like the Homers and, as a rule, are good parents. The short-faced birds, however, need assistance to bring up their young, and unless "wet nurses" are provided, valuable youngsters may be lost. Fanciers who like several varieties can solve this problem by transferring the eggs from short-faced to long-faced birds and *vice versa*, for the short-faces, while apparently unable to rear their own young, are able to feed those with longer beaks.

If a fancier belongs to a pigeon club, he marks his birds with a registered seamless band, which is placed on one leg when the baby pigeon is about five days old.

Pigeons are exhibited as youngsters and as old birds. Some, such as Carriers, Barbs, and Orientals, do not appear at

Pacific and Atlantic Photos, Inc.

THE WORLD'S CHAMPION UTILITY PIGEON AND SOME OF THE 75 CUPS HE HAS WON: A CALIFORNIA PRODUCT

their best until they are from three to five years old. Others, such as Pouters and Fantails, coarsen with age.

In England pigeons are judged both in their single coops and in walking pens, and are marked on the double showing. In the United States only the walking pen is used. In this every bird has to display himself before the judges, just as a horse or dog performs in the tanbark ring.

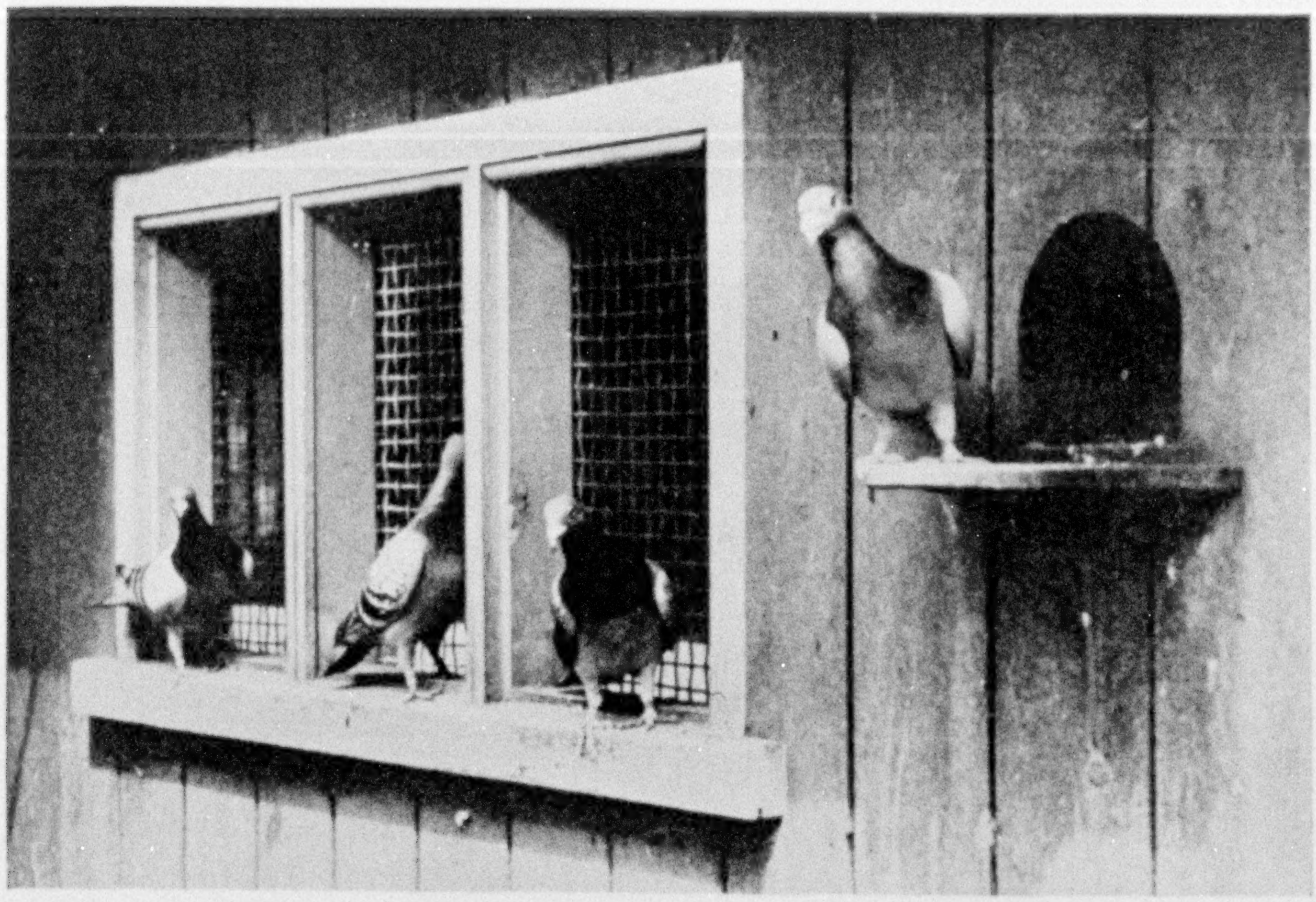
THE FAMILY TREE OF A SILVER-COLORED FANTAIL

Up to ten years ago, American Fantail breeders had striven in vain for good silver-colored birds. In 1916 a pair of my blue Fantails hatched a beautifully colored silver sport, which, upon maturity, proved to be a hen. The next season the parents were remated, but produced only ordinary young and no silvers. Then a mating between the young silver hen and a blue cock of good type and light color gave me two blue youngsters, both cocks. The following year a mating of the better-colored of these two young cocks back to his mother gave two young, both silvers and both hens.

One of those hens has yet to be beaten in the showroom, and last season one of her sons was a champion silver and a grandson won first in his class.

In 1919 the process of inbreeding continued, the old hen being remated to her son, who had produced two silver hens, and the better young silver hen to her blue half-brother, who was also her uncle. These matings resulted in all silvers, both cocks and hens. Since then these birds have been inbred, line bred, and outcrossed (but only on the original family of blues), and to-day the silvers are among the best in my large family of Fantails.

My success in producing this winning strain of silvers was due to several factors. One was the abandonment of the original parents and failure to use the old blue father with his silver daughter. Another was that, thanks to a brother fancier, the very best blues of that time were obtained for use. A third factor was that



KING GEORGE'S PIGEON LOFT AT SANDRINGHAM, ENGLAND

It is feeding time and the birds are waiting for the "dining hall doors" to open. Although the Old World's love of pigeons goes back to prehistoric times, these birds were not used as couriers until the First Crusade, when Christian commanders found the Saracens employing them to convey information.

mere perversity caused me to reject completely the stock scientific formula that yellow mated to blue would give silver.

The offspring produced by this experiment were not only numerous after the second year, but of high quality and resulted in fine silver males which to-day, if bred to blues, produce more silver than blue youngsters.

Regressions constantly appear in the best of pigeon families. A strain of blue Fantails first utilized ten years ago has been bred ever since, with only two outcrosses, one on silver and the other on white. All of these birds were clean-legged, as Fantails are supposed to be; yet last season an excellent young blue hen with grouse-feathered feet appeared.

Also, Fantails are supposed to have fine smooth heads, with no sign of peak or crest, but a pair of birds whose ancestry was known for more than five generations produced a crested Fan.

With regard to breeding for color, yellow saddleback birds have produced reds, blacks, and checkers, but no yellows; red saddlebacks have given not only reds and blacks, but pure whites.

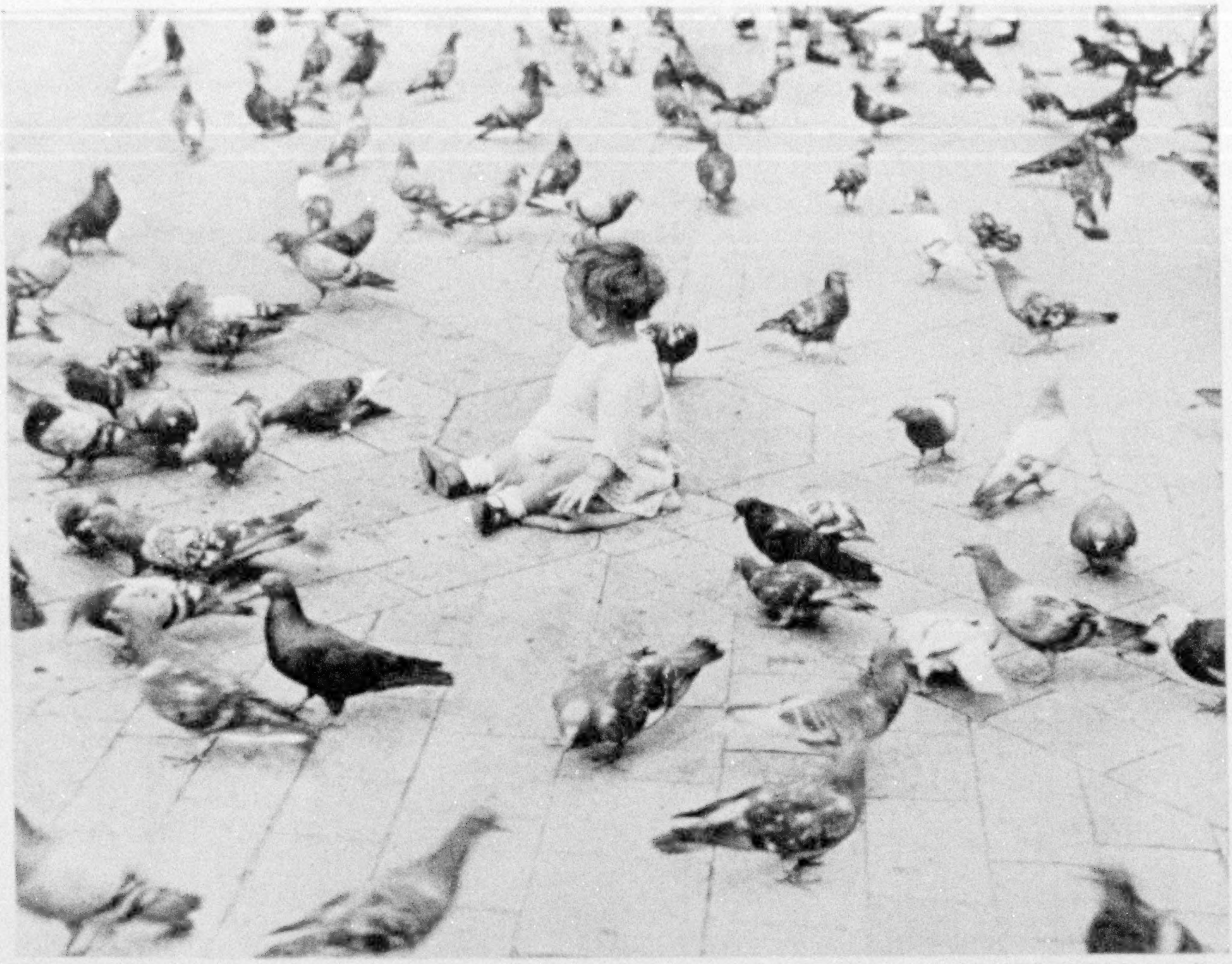
Last year, in an effort to improve blue saddles, a mating between a saddle cock with a solid-blue hen gave a pure-white youngster which proved good enough to win at a Fantail club meet.

The question naturally arises as to what one is to do with these sports and throwbacks. If they are outstanding in good quality, they should be kept and bred, as they possess dominant natures and will, as a rule, influence their descendants for years to come. If bad, even though unusual, they should be killed, for breeding from an inferior causes birds to deteriorate.

PIGEONS FOR PIE

Pigeons are good to eat, and if one breeds only from the best, there are certain to be plenty for the pot.

There are several varieties of pigeons bred mainly for the table, including Runts



Wide World Photograph

PIGEONS OF SAINT PAUL'S CATHEDRAL MAKE FRIENDS WITH A YOUNG VISITOR: LONDON

These birds, as internationally famous as those of Saint Mark's in Venice, are now in disgrace. Their continual pecking at the mortar between the stones of the cathedral has endangered the safety of the portico of the building, and city authorities plan to destroy all except a few, which, for reasons of sentiment, will be allowed to retain their old lofts. Since Parliament has long protected these pigeons, a special act is necessary before their numbers can be legally reduced.

(the largest of all pigeons and one of the oldest), Carneaux, Kings, Mondaines (see Color Plate VII), and Working Homers.

The French were the first to rear squabs for culinary purposes, but within the last 25 years squab-breeding has spread over the world.

The young pigeon is heavier at four weeks, when it is just ready to leave the nest, than at any later period of its life. It is fat and soft and makes one of the finest delicacies served to-day, being especially good for convalescents and children. Squab breeders work the year round and are not separated in winter, as are the fancy and racing birds. If not crowded, they produce from 10 to 14 young yearly.

The most profitable squab plants are those operated by workmen as a side issue, after regular hours, or one-man plants where the owner does all of his own work. Labor and building costs are so high that the expense of additional help and housing above the one-man-plant size is almost prohibitive.

Not all lovers of pigeons are so situated that they can exhibit their birds; but while the showroom and race course provide the final test of a breeder's accomplishments, one's real pleasure and lasting delight are to be found among the birds in the loft. Formal exhibitions are soon over, but one's own aviary furnishes a constant display of beauty and affection, and the fancier's presence is always welcomed most heartily by his feathered friends.

MEASURING THE SUN'S HEAT AND FORECASTING THE WEATHER

The National Geographic Society to Maintain a Solar Station in a Remote Part of the World to Coöperate with Smithsonian Institution Stations in California and Chile

By C. G. Abbot, Assistant Secretary, Smithsonian Institution

RIDING, one day, between Salt Lake and Los Angeles, my newly met seatmate, learning that my business is to observe the heat of the sun, said that he did not believe the sun is hot. "For," said he, "the higher one goes on a mountain or in a balloon, the colder it gets."

What would you say to that? Plausible, isn't it? The secret is the same as that which keeps a windowpane cold. If you sit inside the room in the sun, your black coat and your shoes soon become very warm, while the windowpane, through which the sunbeam comes, keeps its wintry chill.

Sun rays are not heat. They are of another form of energy which we call radiation. It is a wave motion, like radio waves, only enormously shorter in wavelength. Most radio programs come in on waves of 200 to 500 meters; visible sun rays come in on waves of 0.0000004 to 0.0000006 meter, or about 500,000,000 times as short. Clear air and clear glass are very transparent to sun rays, which pass through these substances almost without absorption of energy; but black shoes or clothes, and lampblack still more, absorb sun rays, and their energy is diverted from its beautiful wave-play to promoting the irregular vibrations of the molecules which we call heat.

The upper air is so very transparent that it stays cold, for it absorbs almost no solar energy of radiation, and although a person or a blackened object absorbs even more of solar radiation at high altitudes than at the earth's surface, yet, being surrounded by the very cold air, which is carried along by the winds, his temperature is kept low for the same reason that a fan cools the radiator of an automobile.

Besides charming us in the rainbow, the sunset, and the blue of the sky, sun rays keep the earth warm enough to live on. They maintain the inimitable chemical processes by which plants grow; distill into the clouds all of the ocean water that comes to us as rain;[*] cause all the weather; and, when we get wise enough, they will furnish us a trillion horsepower for mechanical, electrical, and heating purposes, if we need so much power by that time.

No wonder that "Uncle Joe" Cannon once said in the Appropriations Committee of Congress: "I don't care so much about the stars that are so far away that if they were all abolished to-night our great-grandchildren would never know the difference; but everything hangs on the sun, Sherley, and it ought to be investigated. I think this appropriation is all right!"

A GRANT TO "INVESTIGATE THE SUN"

This is just what the National Geographic Society has given me a grant to undertake—to measure the radiation of the sun. But since I have been in this work for the Smithsonian Institution for more than 30 years, members of The Society have a right to know what more is expected to be found out with the aid of this generous grant.

The fact is, we have discovered that the sun is a variable star. Mr. H. H. Clayton, the eminent American meteorologist, who has been coöperating in the work, has proved that very distinct changes of barometer, temperature, and rainfall are caused by these changes of

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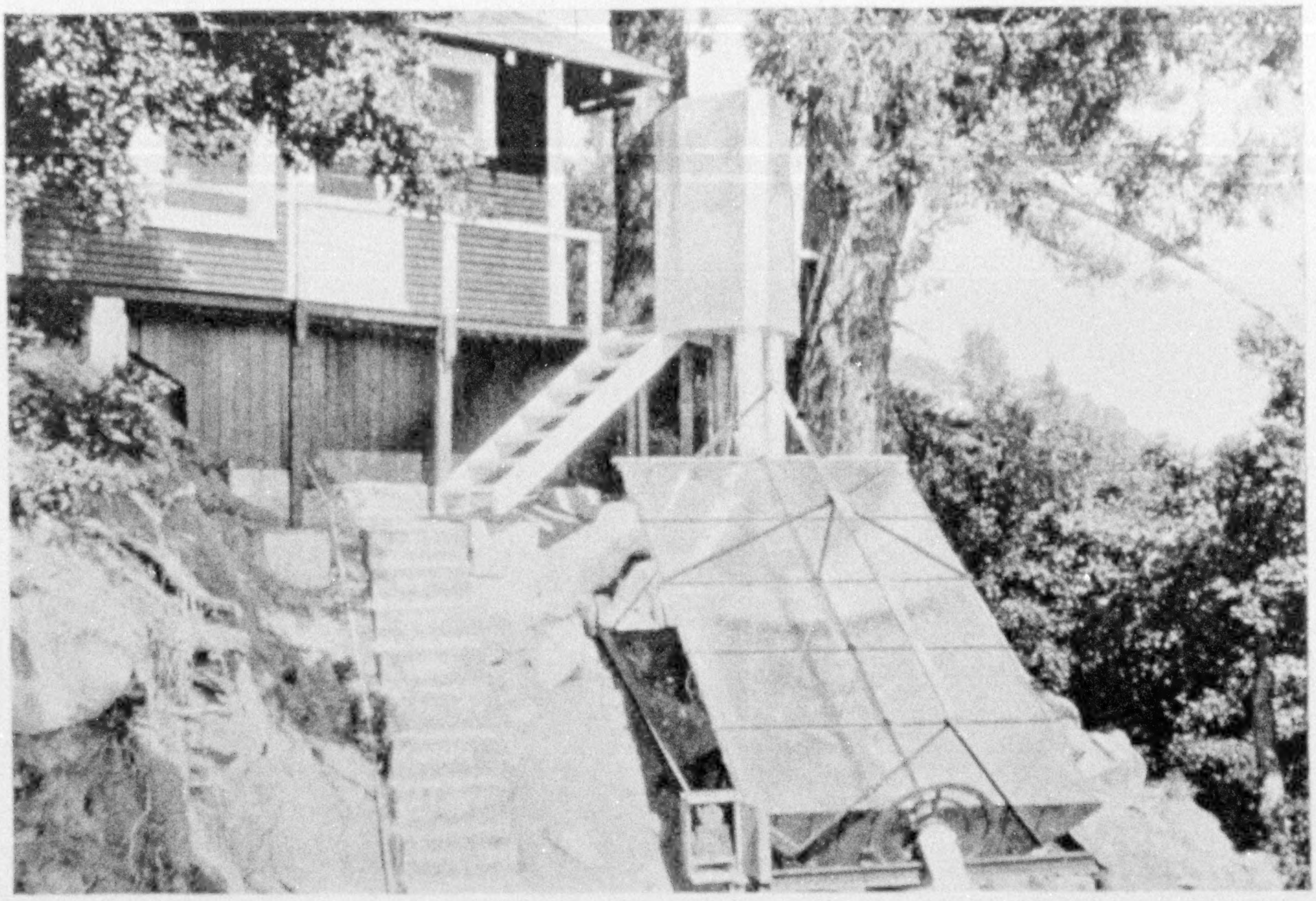
[*] See "Toilers of the Sky," by McFall Kerbey, in the NATIONAL GEOGRAPHIC MAGAZINE for August, 1925.

XUM



Photograph from Dr. C. G. Abbot

THE SOLAR COOKER ON MOUNT WILSON, CALIFORNIA

The lower part of this unique apparatus is a hollow half cylinder, the inner surface of which consists of a great sheet-aluminum mirror which reflects and concentrates the sun rays on a tube, thereby heating oil which runs through it. A clockwork mechanism keeps the mirror always facing the sun. The oven (see, also, page 113) is at the top, and the pipes through which the heated oil circulates connect the two parts of the cooker.

the intensity of sun rays. He even goes so far as to say that he more and more believes, as his studies progress and bring new facts to light, that all that we call weather—symbol for all that is variable, in distinction to climate, which is the steady, average condition of things—is really due to the sun's variation.

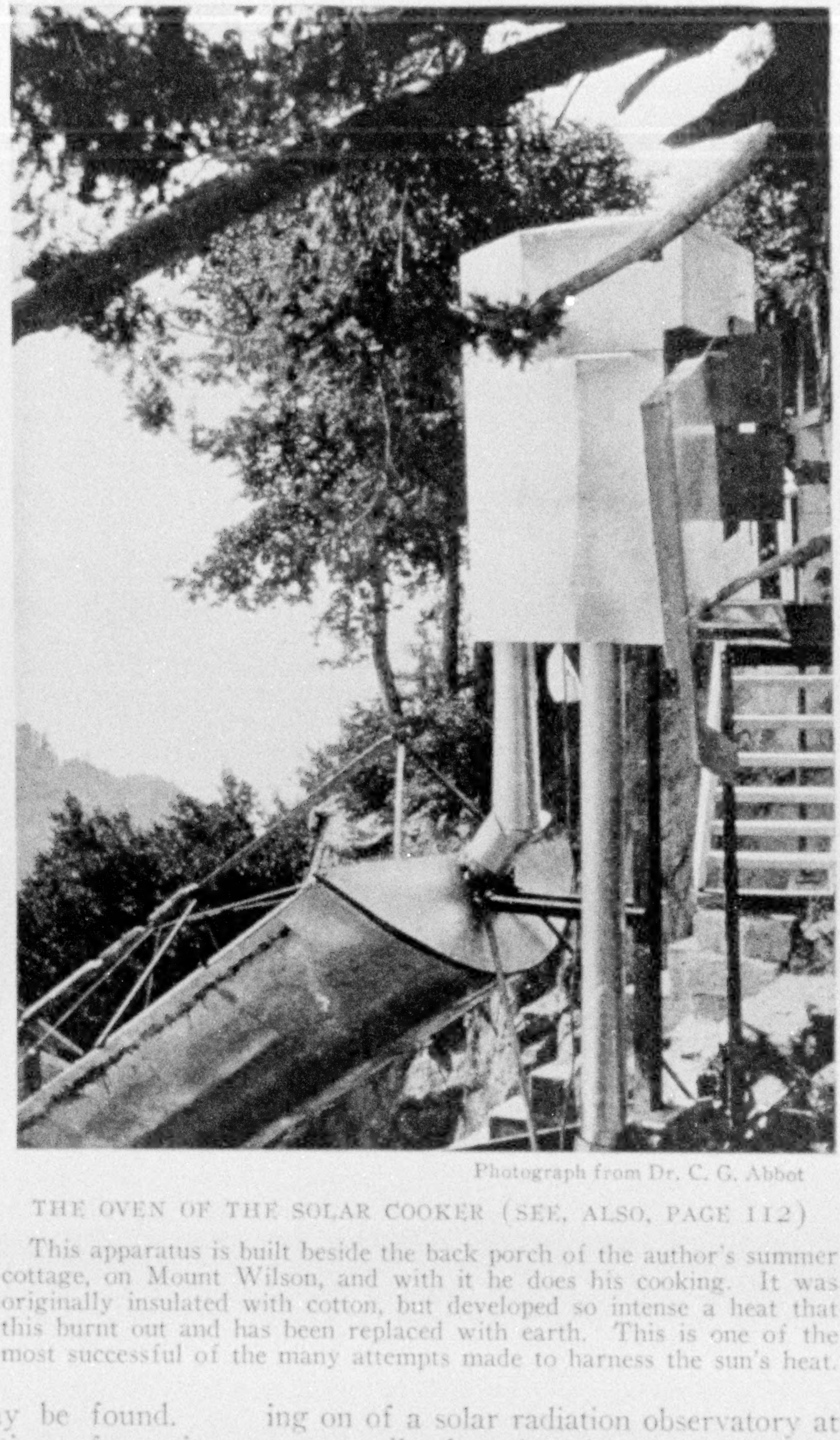
This seems a bold claim. We shall see presently how he supports the claim. What interests us still more is that he finds it possible to predict weather for days, weeks, and even a month in advance, just by using observations of the sun's radiation and its changes.

The astonishing feature about his results is that very small solar changes, even those of less than one-half of one per cent, in the sun's radiation are able to produce considerable changes in the weather. This seems at first rather preposterous. We think of night and day, with 100 per cent change from light to darkness, and of the great change of intensity of the sun's rays between summer and winter. Neither of these tremendous changes of solar radiation gives tremendous changes of temperature.

We must forego possible explanations of Clayton's paradox, merely remarking that a small pull of a pistol trigger can do great damage; and something analogous may be involved here.

A THIRD OBSERVATORY TO BE BUILT IN A DISTANT LAND

We are only thinking now that if a half per cent change is important, it throws a hard task upon him who has to determine the sun's variation. A half of one per cent is a pretty small quantity anywhere. Think of measuring from under an ocean of air, filled with water vapor, clouds, and haze, and having to get so exact a measure of the losses produced by these factors that a half of one per cent can be detected in solar rays, as those rays are outside our atmosphere altogether!



Photograph from Dr. C. G. Abbot

THE OVEN OF THE SOLAR COOKER (SEE, ALSO, PAGE 112)

This apparatus is built beside the back porch of the author's summer cottage, on Mount Wilson, and with it he does his cooking. It was originally insulated with cotton, but developed so intense a heat that this burnt out and has been replaced with earth. This is one of the most successful of the many attempts made to harness the sun's heat.

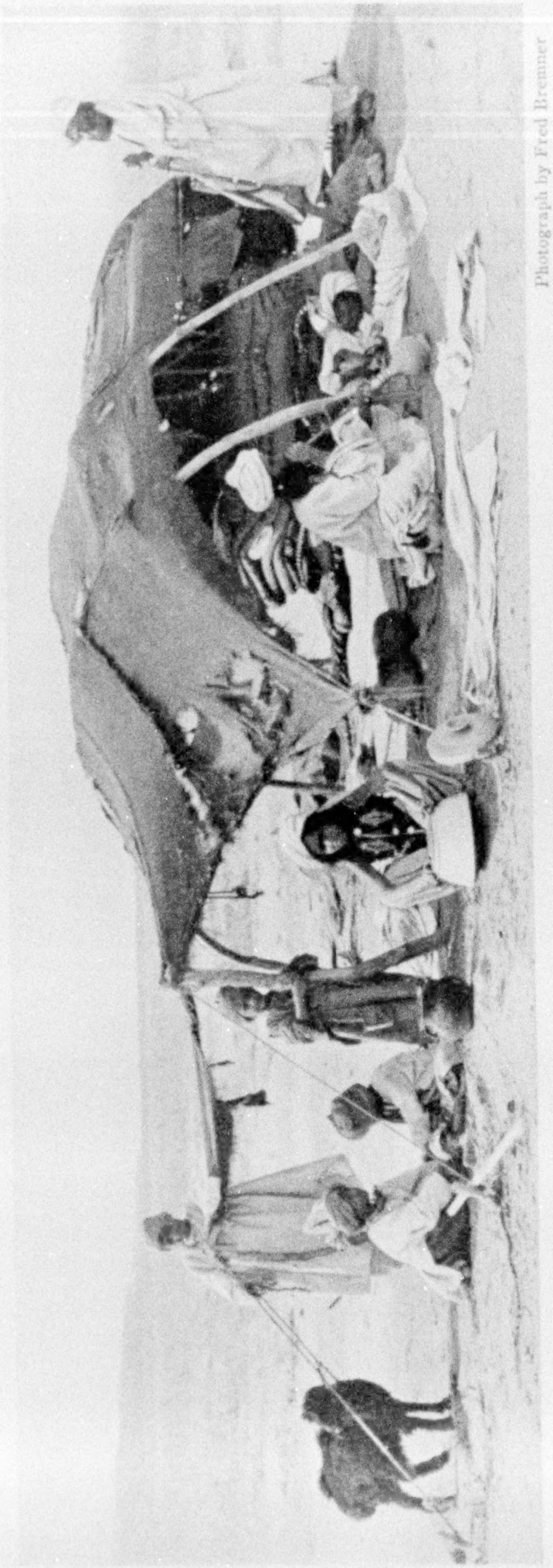
This is what the Smithsonian Institution has attempted to do by keeping up two observing stations, one in California and one in Chile; but it has proved impossible quite to reach the desired accuracy. Now the National Geographic Society, appreciating the world-wide importance of the work, has come to the rescue by offering to build, equip, and support for several years a third observatory in another part of the earth.

Where do we locate these solar observatories, and why? On desert mountains, to avoid clouds; far separated, so as to be quite independent in atmospheric sources of error; situated at high altitudes, so as to diminish the errors of allowing for atmospheric losses; in regions easy of access, so that complicated outfits and supplies can reach the stations; under stable, enlightened governments, safe from theft and massacre, and where supplies and society may be found.

An exacting combination of requirements surely! When one adds to this the necessity of selecting for each station a director who shall be able to make the observations, make the instruments, also, if he has to, keep up a cheerful front in a lonesome corner of the world, deal tactfully with the citizens of the country, be appreciative of their kindnesses, yet firm enough in moral principle to stick by his job and keep straight while his leisurely neighbors are having a good time and inviting him to join them—surely, the carrying on of a solar radiation observatory at 10,000 miles from base is quite a problem!

As I see it, there are only three promising places remaining available. One is Algeria; another, British Baluchistan; the third, Southwest Africa, now under British mandate. In one of these three regions I hope to install The Society's new station within a year, and to place in charge of it a trained man meeting all the requirements named, and with him a worthy assistant.

Already, the apparatus is being prepared. It will take some months to com-



Photograph by Fred Brenner

A BALUCH CAMP: INDIA

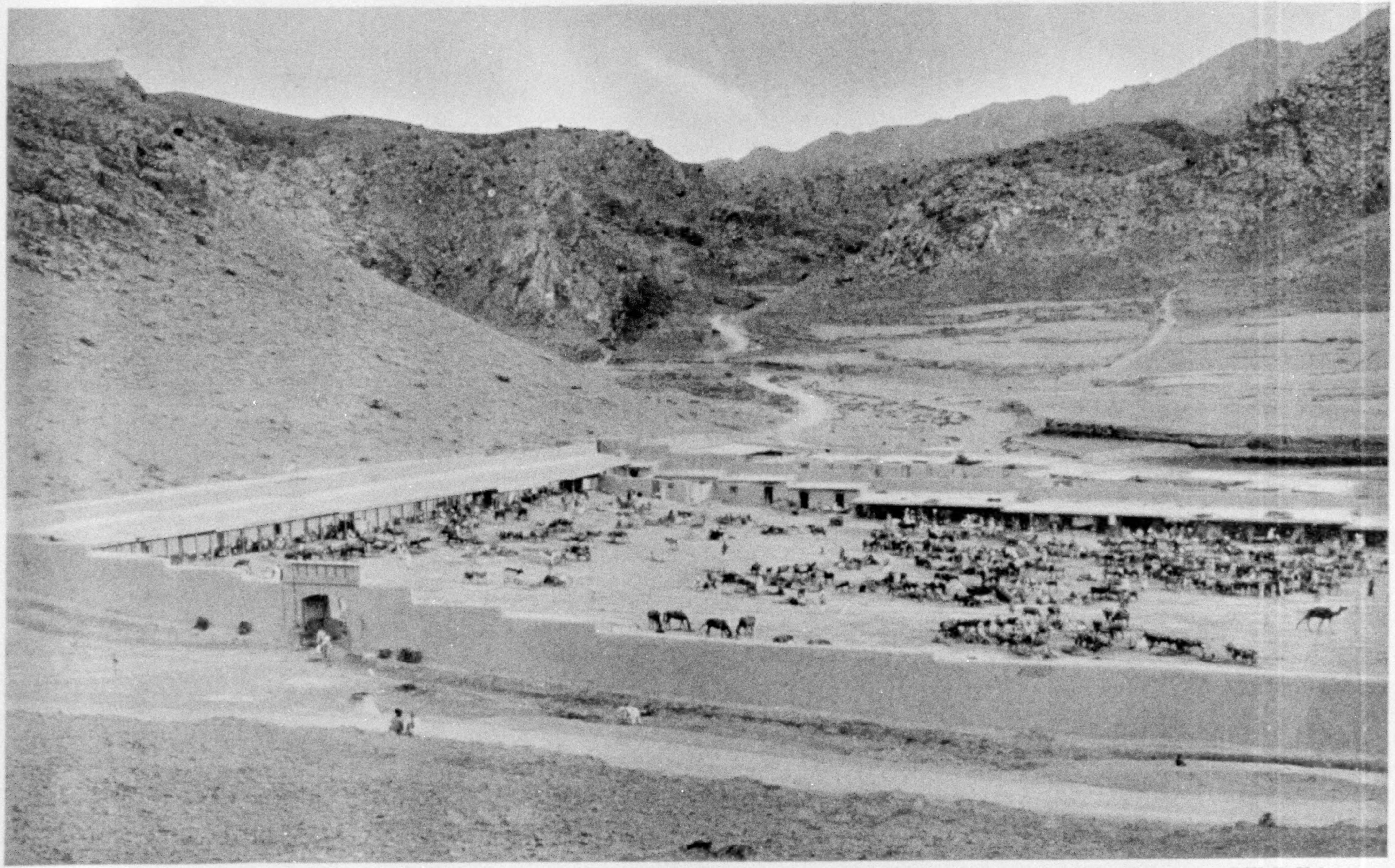
The Baluch tribesmen constitute an important element in the heterogeneous population of Baluchistan. They are nomads, camping in blanket tents, temporary bark huts, or even in caves in the hillsides. Although disinclined to work, since he regards manual labor as degrading, the average Baluch is honorable, temperate, and courageous. In British Baluchistan, Algeria, or Southwest Africa, the National Geographic Society's solar observatory will be established within the year (see text, page 113).

plete it and to prepare the buildings for its reception. The outfit is unique, altogether strange in an astronomical observatory. I shall try to describe it and what we do with it.

MANY DELICATE INSTRUMENTS ARE REQUIRED

Our astronomical observatory is without a telescope. We employ a machine called the cœlostat to reflect the sun's rays constantly in a fixed direction into the observing chamber. It has two mirrors, one rotating half as fast as the earth, the other stationary. The first reflects the sunbeam in a certain fixed but inconvenient direction. The second sends it horizontally north and south into the laboratory, all conveniently for use (see page 123).

These mirrors cannot be silver-backed like ordinary hand glasses. It would be harmful for the sunlight to go through glass. Accordingly, it is reflected from the front surfaces. We formerly used silvered mirrors; but silver, when open to the air, tarnishes on mirrors just as it does on dining tables. We now use the very hard alloy stellite—a costly material, that is still more costly when ground and polished to a perfect optical figure. Its hardness is so great that a carborundum grinding wheel will not send off a train of



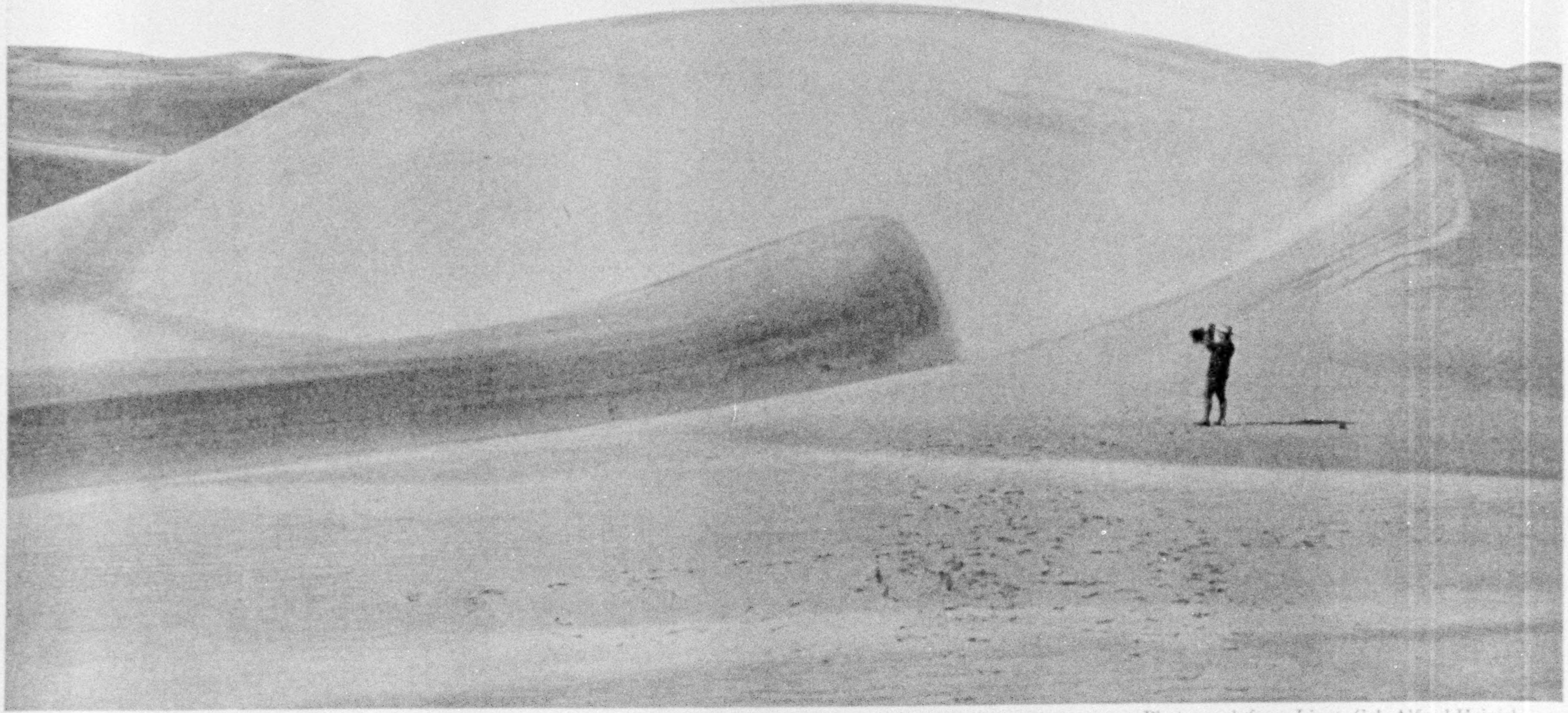
© W. D. Holmes

THE SERAI, OR CARAVANSARY, AT LANDI KOTAL, INDIA

In this walled inclosure travelers and their beasts of burden find water, food, shelter, and protection from the bandits that frequent the hills of Baluchistan, Afghanistan, and the Northwest Frontier Province. "Where do we locate solar observatories, and why? On desert mountains; far separated; at high altitudes; in regions easy of access" (see text, page 113).

Photograph from Levasseur

A CARAVAN ON THE MARCH IN THE ALGERIAN SAHARA, WHERE AMERICA'S THIRD SOLAR-RADIATION OBSERVATORY MAY BE ESTABLISHED (SEE TEXT, PAGE 113)



Photograph from Lieut. Col. Alfred Heinicke

A MOVING SAND DUNE NEAR SWARTOOG, IN SOUTHWEST AFRICA

Because of the conditions required, only a few parts of the world remain available for the location of a solar-radiation observatory. One of these is Southwest Africa, where great moving sand dunes such as this are among the difficulties to be faced and overcome.

THE BEACON ON THE SITE OF DIAZ PILLAR, LÜDERITZ BAY, SOUTHWEST AFRICA

In 1487 Bartholomeu Diaz, the Portuguese explorer who first rounded the Cape of Good Hope, erected a pillar on this point of land in Lüderitz Bay. At present a fog-signal station is located there, and the picture shows a steam boiler being hauled up to it. It is possible that somewhere in this region of Southwest Africa the new solar-radiation observatory sponsored by the National Geographic Society will be established.

sparks from stellite as it does from hard steel, but only very slowly makes any impression on it.

Within the observatory, the sunbeam falls into a spectroscope, which breaks it up into the beautiful band of color which we call the spectrum—violet at one end, red at the other. The eye is not able to see that for some distance beyond the red there are still solar rays, and beyond the violet others also. X rays lie still farther beyond the violet, but with these we do not have to deal.

Since neither the eye nor photography can observe the whole gamut of solar spectrum rays, we are obliged to absorb them on a lampblack surface, so that they produce their equivalent as heat. We then measure the solar-ray power in terms of the heat it produces.

A very delicate electrical thermometer for this purpose was invented by Dr. Langley, a pioneer in solar-radiation measurements, as he was later in aviation. He called his instrument a bolometer, which means "a ray-measurer." It consists of two blackened, hairlike ribbons of platinum, each about one-half inch long, 1/250 inch wide, and 1/2000 inch thick. These are joined by two coils of wire to form a "Wheatstone's bridge," and connected with an electric battery and a highly sensitive galvanometer.

Houses are lighted by electric lamps which use about one-fourth ampere of current. The apparatus we are describing detects current changes ten billion times smaller. It also detects changes of temperature of one of the little platinum ribbons of less than a millionth of one degree.

The solar spectrum, being moved along from beyond the violet to beyond the red, passing over one of the sensitive ribbons of the bolometer, produces its tiny heating effects, and causes thereby swings of the sensitive galvanometer index. A record of these is kept on a moving photographic plate. Thus we produce automatically, in seven minutes of time, a

THIRD
WOMEN
عورتوں کے لئے
औरतों के वास्ते
1 9 5

Photograph by Maynard Owen Williams

A THIRD-CLASS RAILWAY COACH FOR WOMEN IN BRITISH BALUCHISTAN

So many languages and dialects are used in India and there are so many people who cannot read any language that pictures are used in labeling the compartments of the railway coaches.

measurement of the heat found in all these solar spectrum rays, from far beyond the visible violet to far beyond the visible red.

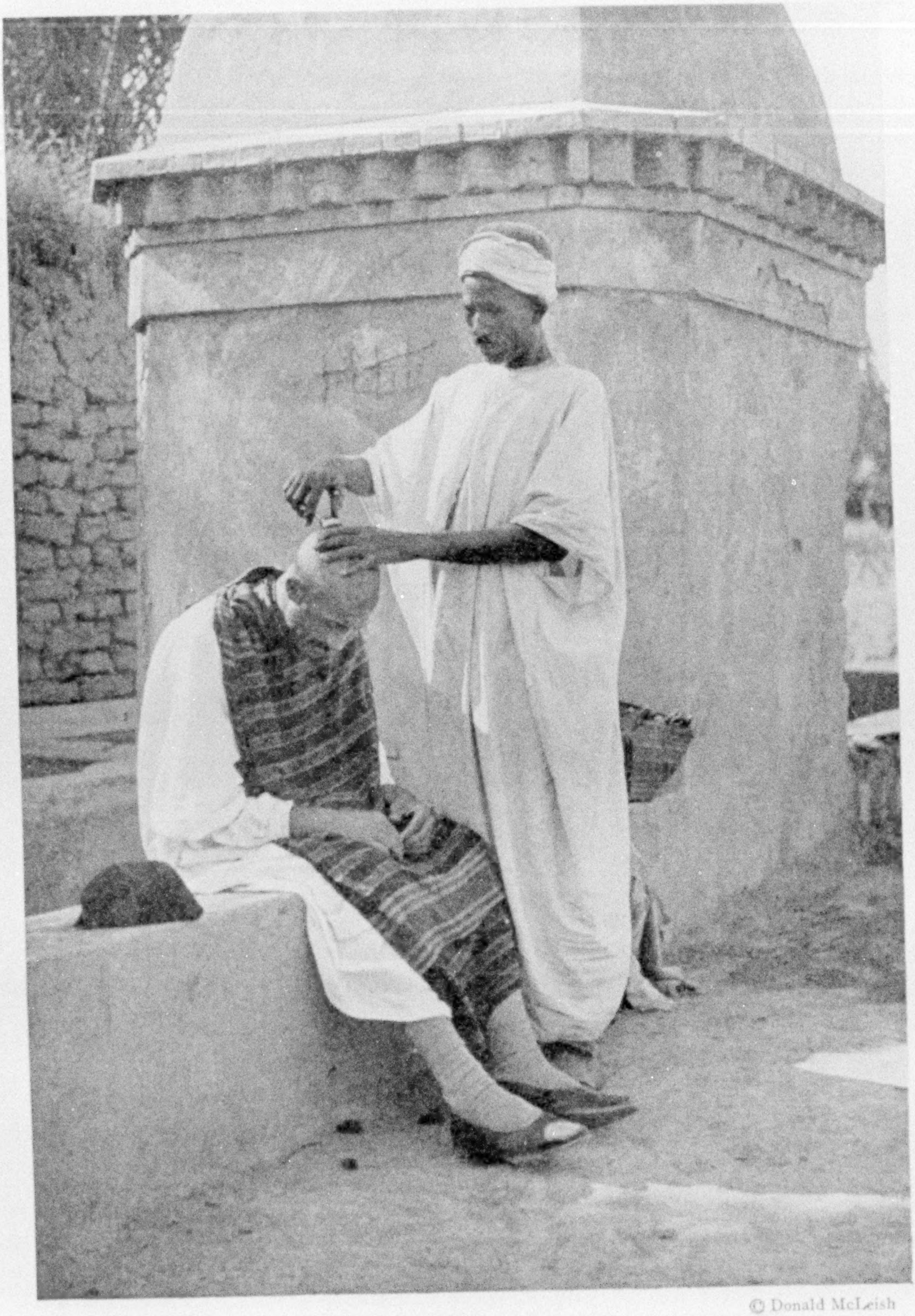
HEAT RAYS ON A WORLD WITHOUT ATMOSPHERE ARE COMPUTED

Why is this necessary? Because our atmosphere attenuates differently the several rays of the spectrum. We have to measure its effect upon each of them. By measuring intensities first at low sun, when the atmospheric path is oblique and very long, and again, later, at high sun, when the path is nearly direct and much shorter, we come into possession of the facts which enable us to compute what energy each solar-spectrum ray contained outside the atmosphere altogether.

Summing up these computed energies for all the spectrum rays, we find at last what the total of solar heat would have been if we had taken our stand on the moon, with no troublesome atmosphere to interfere. Reducing our result to what it would be at the average solar distance, for the earth is 3,000,000 miles farther away in July than in January, we reach at last our goal. We thus find the total intensity of energy of the sun rays for the day. Comparison with similar measurements of other days reveals the variation of the sun.

This is the simplest picture one can draw of the subject. There are various complexities not necessary to rehearse here. They demand still other kinds of apparatus, much of which we have invented and also constructed at the Smithsonian Institution. Altogether, the outfit for an observing station for this work comprises about 20 principal pieces of physical apparatus, with many little auxiliaries, weighs when boxed for transportation some two tons, and costs nearly $8,000.

Having given an inkling of what we are after and how it is attained, let us now turn to the actual results and their applications to weather forecasting. We express our measurements of the intensity of solar radiation in calories, that familiar word to those who study food values. There are, however, two kinds of calories.



© Donald McLeish

A STREET BARBER OF BISKRA, THE BEAUTIFUL OASIS VILLAGE OF ALGERIA

The author of the accompanying article is now visiting Algeria in search of a suitable place for the establishment of the National Geographic Society's solar-radiation observatory (see text, page 113).

Photograph from Dr. C. G. Abbot

A MIXED QUARTET AT BASSOUR, ALGERIA (SEE, ALSO, PAGES 125 AND 126)

This farmer seems to be carrying out the Mosaic injunction set forth by St. Paul in his first letter to Timothy, that "thou shalt not muzzle the ox that treadeth out the corn." However, the yoke prevents the hungry-looking horse from taking any part in the feast.

One is spelled with a capital C. That is the one used by food experts. We use the kind spelled with a small c. It is 1/1000 as large a unit as the other. In units of heat, the intensity of solar rays at mean solar distance outside our atmosphere is called "The Solar Constant of Radiation."

STATIONS 4,000 MILES APART CHECK EACH OTHER'S OBSERVATIONS

From several thousands of measurements of it, some from sea-level, others from mountains of from one to three miles' altitude, and from one set of automatic measurements from a free balloon at an altitude of more than 15 miles, we state the mean value of the solar constant as 1.938 calories per square centimeter per minute.

This means that if we should take a cube of water 1 centimeter (about three-eighths inch) on edge, blacken it so that it would completely absorb solar rays, and expose one of its surfaces at right angles to the sunbeam from a station upon the moon, in March or September, when the solar distance is at its mean value, the rise of temperature would be 1.938 degrees centigrade.

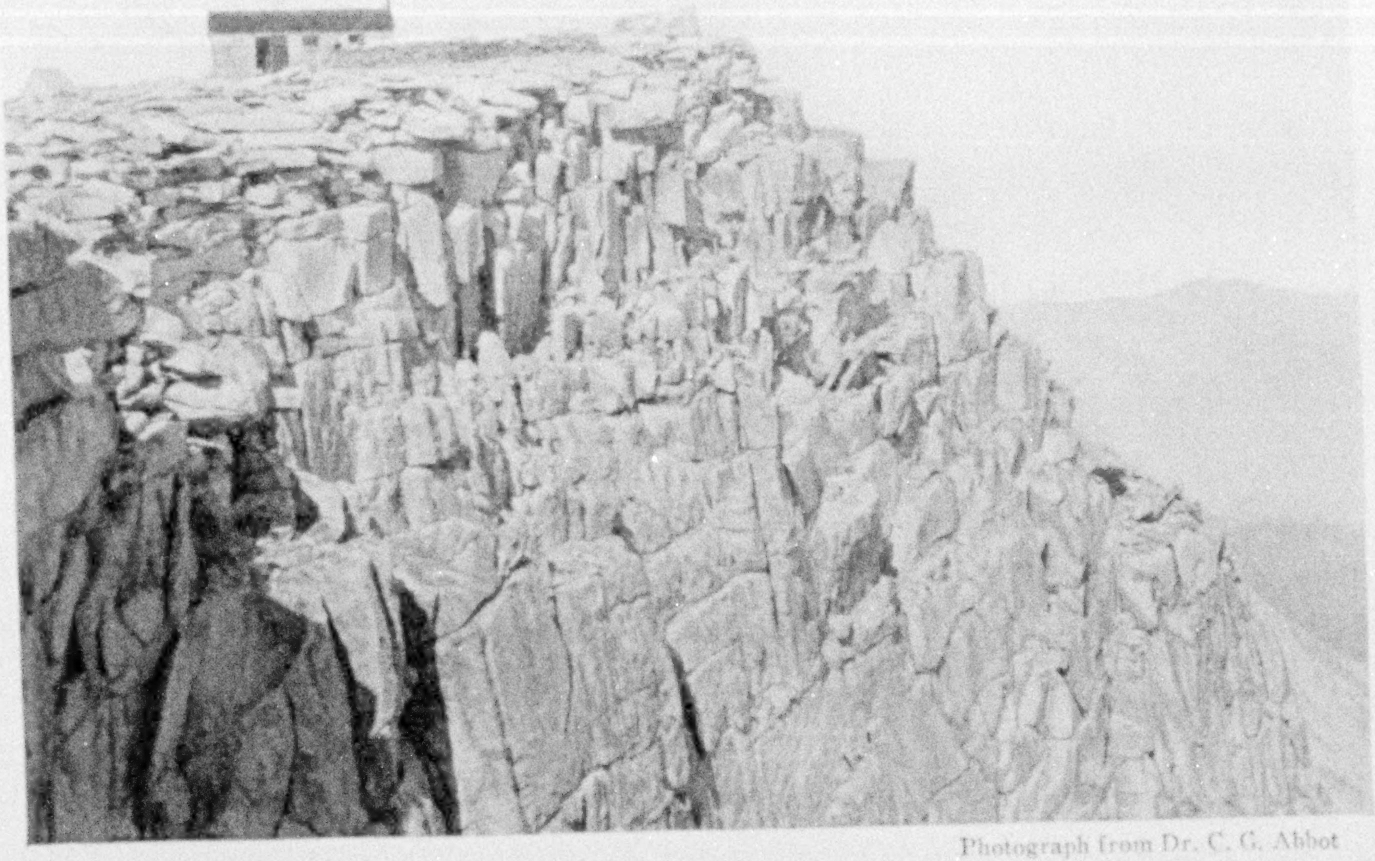
"Solar constant" is a misnomer, for we find solar-radiation values variable between the limits 1.85 and 2.03 calories—a range of nearly 10 per cent. Such extreme values are very rare, but fluctuations of 2 or 3 per cent from the mean are not uncommon. What evidence can we bring forward to support this claim?

Not only do the two independent stations of the Smithsonian Institution, in California and Chile, which are 4,000 miles apart, in opposite hemispheres, support each other, but visible changes in the sun go hand in hand with our measurements.

SUN SPOTS AFFECT AMOUNT OF HEAT RECEIVED ON THE EARTH

Increased radiation is to be expected when sun spots are numerous.

The sun rotates on its axis in about 27 days. Hence, sun spots and other visible features cross the solar disk in about half



Photograph from Dr. C. G. Abbot

AN OBSERVATION SHELTER ON MOUNT WHITNEY, CALIFORNIA

On the summit of this, the highest peak in the United States outside of Alaska (14,501 feet), representatives of the Smithsonian Institution have at various times made solar-radiation observations.

that time and remain the other two weeks on the sun's invisible hemisphere. When in this rotation a sun spot crosses the central part of the visible disk, we almost invariably observe a depression of our solar-radiation values.

A notable case attended the great sun-spot group of March, 1920, which caused magnetic storms on the earth and great displays of Northern Lights. So we see that while the presence of many sun spots betokens high solar-radiation values, each individual spot, as it crosses the sun's center, pulls the value down.

We think there is a sort of cloudiness over each sun-spot group which intercepts a part of the sun rays when it passes between the earth and the sun. Sometimes the depressing effect greatly exceeds the positive one due to increased solar activity. This is doubtless why, when spots are very numerous, the average solar-radiation values are sometimes made lower instead of higher.

Besides the sun spots, we see on the solar surface bright patches called faculæ. When these are numerous, solar radiation values run high. Mr. Clayton has even made use of this relation to predict for five days in advance what values of solar radiation we are going to observe. He examines the sun with a telescope and sends a letter to the Smithsonian Institution, giving his prediction. The results of seven months' consecutive daily predictions of this character run strongly in his favor.

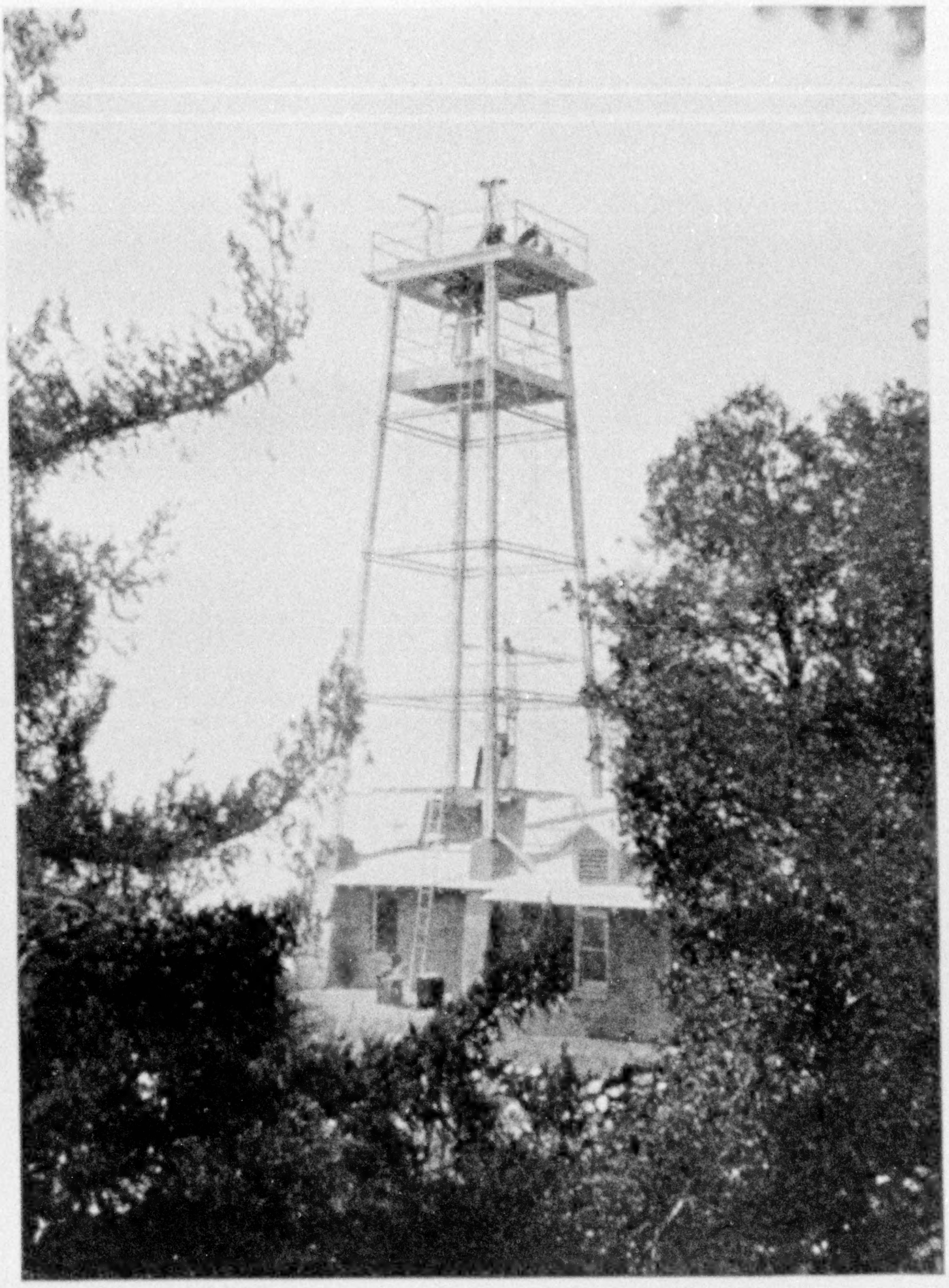
Hence, we see that many visible phenomena upon the solar surface undergo changes closely associated with our measurements. This fact cannot but strongly support the view that we are on the right track, and that our indications of changes in the sun's output of energy are real. The sun, in other words, is a variable star. There is evidence that some of the other stars vary in a manner similar to the solar variation.

But what of the practical applications of all this? Can we make use of solar variation to predict the changes of weather upon the earth?

A good many people during the past century, since sun spots came prominently into the field of study, have endeavored to base weather forecasts upon their appearance. Among these sun-spot prophets in our country have been the late Henry C. Maine and Father Ricard. As we have shown, there is a real relation, though not a very close one, between the appearance of sun spots and the heating effect of the solar rays. It is not, therefore, surprising that some measure of success may have attended these sun-spot forecasters.

WEATHER PREDICTIONS BASED ON SOLAR RADIATION

About ten years ago, however, Mr. Clayton, who was then chief forecaster for Argentina, undertook to study the exact relations which exist between the weather and our results on the intensity of solar radiation. Realizing that our observations of that time were faulty, he did not attempt to use them individually, but took means of groups of high, medium, and low solar values for his researches.



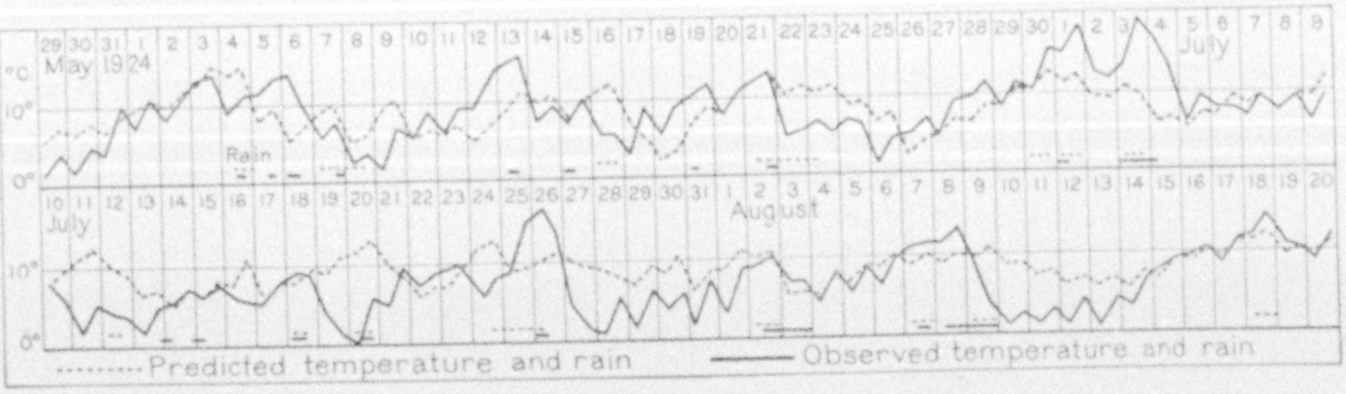
Photograph from Dr. C. G. Abbot

OBSERVING TOWER AT SMITHSONIAN STATION ON MOUNT WILSON, CALIFORNIA

While many of the original observations of the solar-radiation experts were made at the now abandoned Harqua Hala station, in Arizona, conditions in California were found to be better adapted to the work. The apparatus at the right, on top of the tower, is a cœlostat, which by a double-mirror arrangement reflects the solar beams down into the laboratory, at the base of the tower (see p. 114).

Thus, with the years 1913, 1914, 1915, and 1918 grouped in this manner and compared to the temperature of Buenos Aires, he obtained certain results. The departure of Buenos Aires' temperature from normal having been tabulated, corresponding to each of the days of high solar radiation, and not only for the day itself, but for every succeeding day to the twentieth, he then took the mean values for all these tabulated days of high solar radiation and for their successors.

In this way he determined the average march of temperature accompanying and following high values of solar radiation. He made similar determinations for the medium and the low solar conditions. The comparison is very striking. Starting from a low value on zero day, the temperature soon reaches normal, and not till the tenth day do the highest effects



WEEKLY FORECASTS FROM SOLAR DATA, WITH VERIFICATION: ARGENTINA

The dotted lines show predicted temperature and rain in the Weekly Weather Forecast from May 29 to August 20, 1924, issued from Buenos Aires. The solid lines show the observed temperature and rain for the same period (see text below).

prevail. Then follows a decline and a new rise.

Almost exactly opposite consequences follow states of low solar radiation. Mean solar values yield continuously mean temperatures for Buenos Aires. The astonishing thing is that the maximum difference in temperature at Buenos Aires between high and low conditions of the sun occurs, not on zero day, but on the tenth day after.

It is probable that the average solar values stated by Mr. Clayton show excessive range, because our Mount Wilson observations of that time were very faulty, and many days must have been high or low from error, not from true solar changes. The range of 5 per cent indicated in the solar values should very probably be regarded as no more than 2½ per cent, and corresponding to it we find 6° Fahrenheit ten days after the event.

Here, indeed, was a bright forecasting prospect. Mr. Clayton continued his studies, and after the Smithsonian Institution had established its Chile station the Argentine Weather Bureau arranged to receive our daily solar observations regularly by telegraph.

A PUBLIC TRIAL OF LONG-RANGE FORECASTING

By December, 1918, Mr. Clayton was ready for a public trial of a new method of long-range forecasting. From that time to the present, the Argentine weather service has issued every Wednesday an official bulletin giving an exact forecast of the temperatures to be expected each morning and evening at Buenos Aires for the week beginning on Thursday. The bulletin also includes the dates and intensities of expected rainfall. These bulletins are not given away, which, of course, would be easy, but are sold to clients.

The chart on this page shows the forecasts for twelve consecutive weeks in the year 1924 and the actual temperatures and rainfall which occurred.

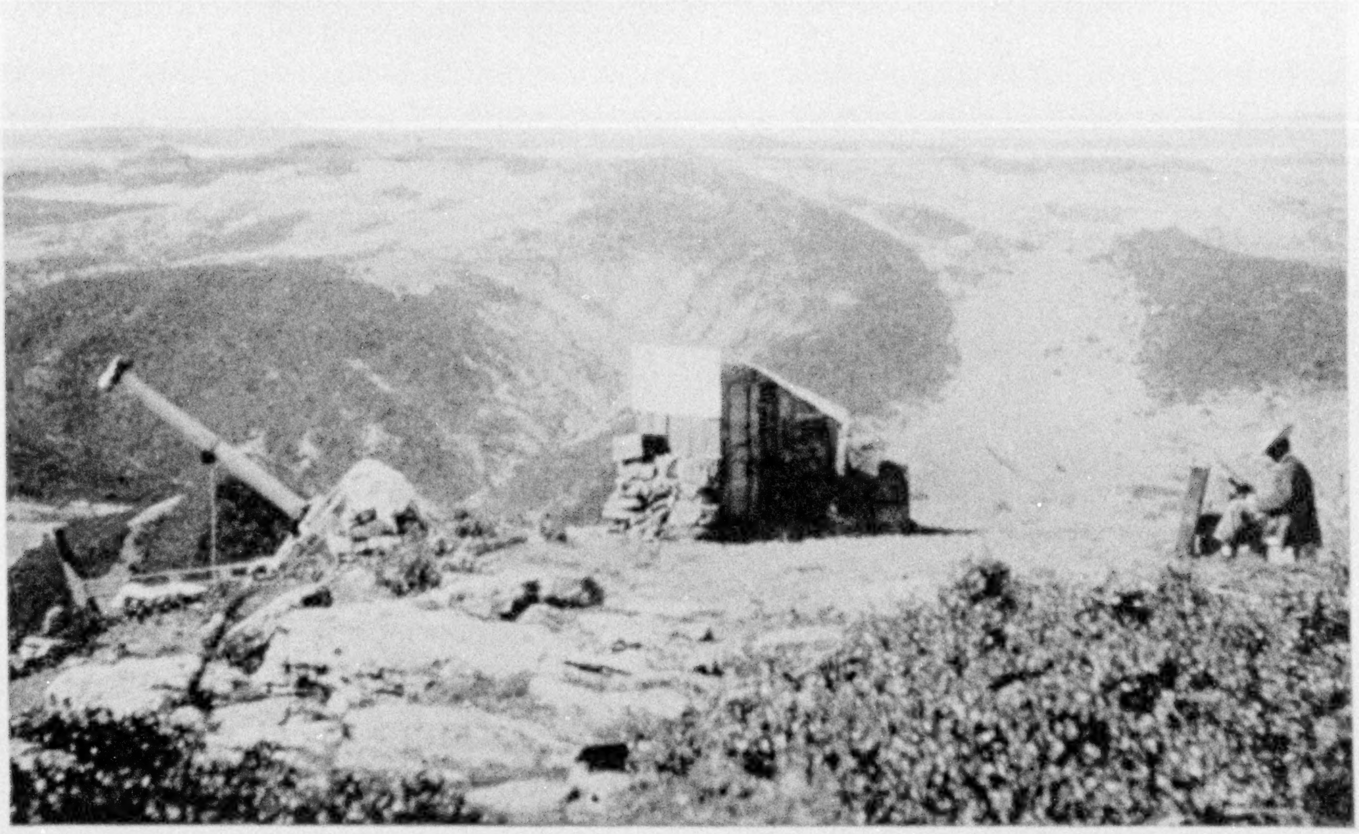
Retiring to private life in 1922, Mr. Clayton returned to the United States and published a notable book, "World Weather," in which a summary of his studies of the relations of solar changes to weather conditions is included.

Later, by the aid of a grant from Mr. John A. Roebling, Mr. Clayton began the study of solar variation as related to the weather of North America. As it seemed the best way to prove the usefulness of these researches, he undertook to forecast experimentally for the city of New York.

In order that the experiment might lack no element of trustworthiness, it was arranged that the Smithsonian Institution should forward to Mr. Clayton each morning its telegraphic advices of solar conditions of the day preceding, received from the field stations of California and Chile. He thereupon prepared a definite forecast of the exact maximum temperature to be expected at New York for the third, the fourth, and fifth days from the solar observation, and mailed the forecasts about noon to the Institution.

Thus, Mr. Clayton had no further possible control of his forecasts for two, three, and four days, respectively, before they were to mature.

After a full year of this experiment, the forecasts were compared with the official records by a computer at the Smithsonian Institution. A very decided



A TEMPORARY OBSERVATION STATION AT BASSOUR, ALGERIA

This station was located in the Algerian desert, at an altitude of about 5,000 feet. The tube on the left is a spectrobolometer, which measures the intensity of all the wave lengths in the spectrum. The man on the right is reading a pyrheliometer, an instrument used to measure the total radiation being received.

Photographs from Dr. C. G. Abbot

MONTEZUMA SOLAR-RADIATION OBSERVATION STATION NEAR CALAMA, CHILE

This is an almost ideal location for observing solar radiation. It is situated on the western slope of the Andes, in the Desert of Atacama, at an elevation of about 10,000 feet. This is one of the most desolate of the world's desert places, where not even the hardiest cactus will grow. All the water used by the observers at this station has to be hauled 12 miles.

Photograph from Dr. C. G. Abbot

NATIVES OF BASSOUR, ALGERIA

At one time a solar-radiation observatory was maintained in the North African desert near this town. The natives were hospitable and friendly to the scientists, as well as exceedingly curious about the work being undertaken and the instruments used.

prevision was plainly shown. In order to illustrate this, we have taken in three groups: (*a*) all the occasions when Mr. Clayton forecasted for the fourth day temperature departures from normal above +4°, (*b*) below —4°, and (*c*) between these limits.

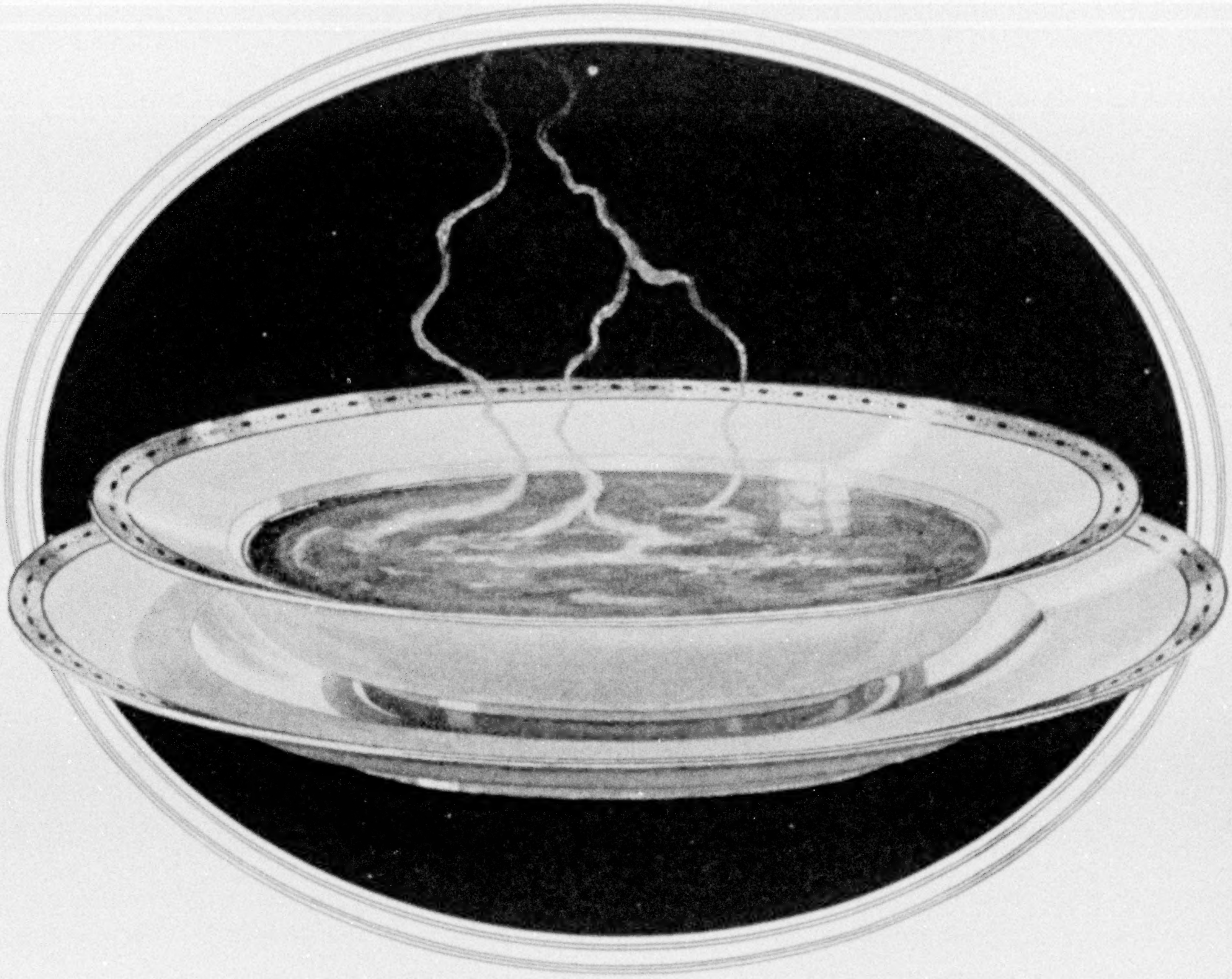
It was clear that he hit the zero day of his forecast very accurately, and that, as it turned out, his plus expectations averaged nearly 3° above his minus expectations, while his normal expectations were really normal.

Not only did he prepare these forecasts for definite days, but on Friday of each week, and on about the 28th day of each month Mr. Clayton mailed to the Smithsonian Institution forecasts of the expected departures from normal maximum temperatures for the following weeks and months. Of 51 weeks, 31 proved to be forecasted with the correct sign. The event showed an average departure of those forecasted plus from those forecasted minus of +2.7°. Of 12 months, 7 proved to be forecasted with the correct sign. The event showed an average departure of those forecasted plus from those forecasted minus of +4.4°.

In all these experiments Mr. Clayton, being at his home in Massachusetts, had no help from official weather records other than those published in the daily newspapers. Doubtless, if the full official information had been available, somewhat higher accuracy might have been reached in the three-, four-, and five-day work, although the present Argentine practice is to make the long-range forecasts on solar data alone without use of the daily weather map.

The Smithsonian Institution has lately published papers by the writer, by Clayton, and by Hoxmark, giving more extended accounts of these interesting researches. Enough is given here, I hope, to convince members of the National Geographic Society that a promising opening has come in the study of that puzzling changeling, "The Weather," and that, with the generous aid of The Society, the Smithsonian Institution will be able to obtain valuable evidence to promote further progress.

A SOUP WITH THE DELICACY OF FLAVOR THAT ONLY FRENCH CHEFS CAN IMPART!

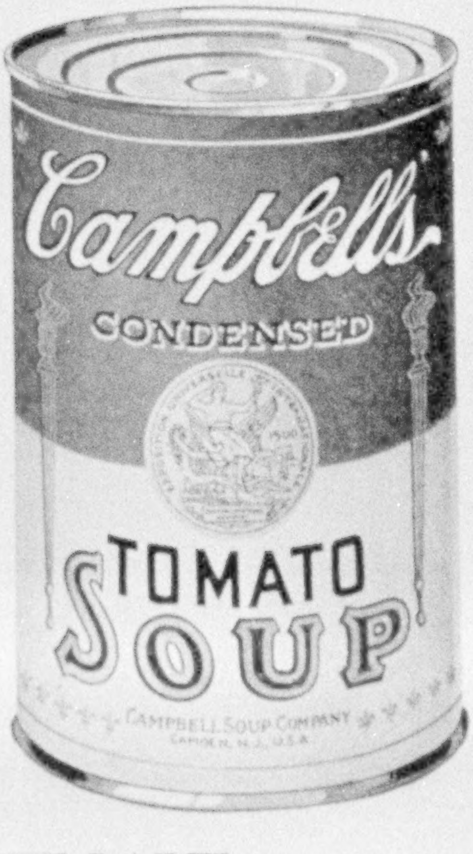


It is nothing short of a privilege for your appetite, to give it the refreshment and enjoyment of a hot, savory plate of Campbell's Tomato Soup.

For this is tomato soup with a difference. You will sense the distinction of it at once. There is the nicety and the subtlety of the French touch—the skill which creates with splendid ingredients a genuine "event" for your taste.

It is the puree of tonic tomato juices and luscious tomato "meat," blended with nourishing butter and seasoned, of course, just as your appetite would have it.

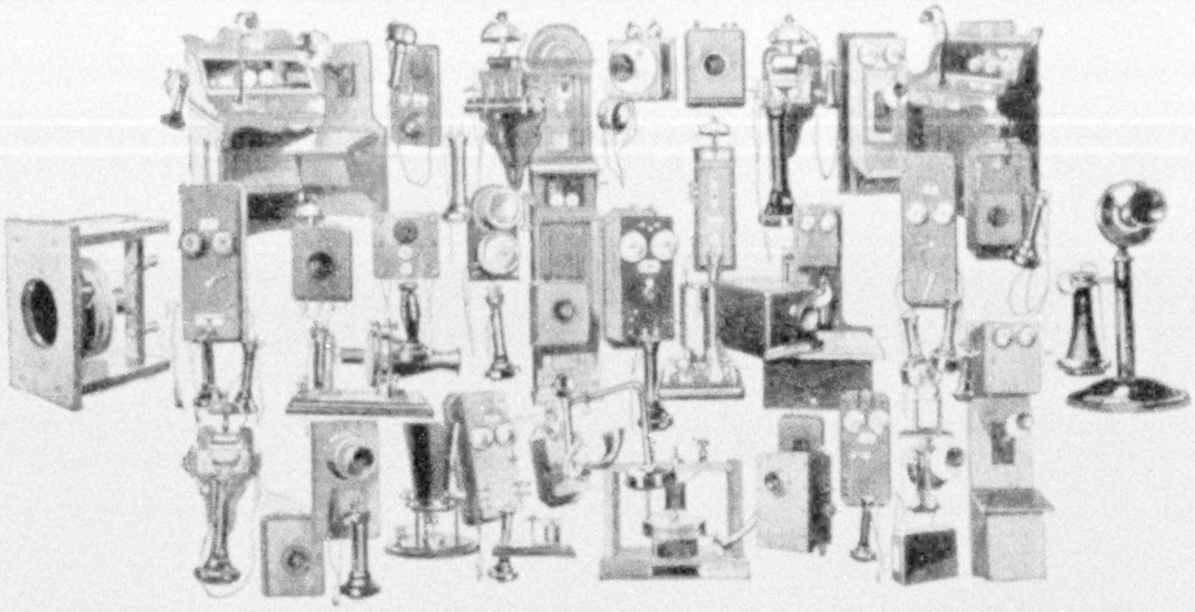
Cream of Tomato, too, is never quite so appealing as when prepared with Campbell's according to the simple directions on the label.



21 kinds
12 cents a can

LOOK FOR THE RED-AND-WHITE LABEL

XUM



An Account of Stewardship

FIFTY years ago Dr. Alexander Graham Bell was busy upon a new invention—the telephone. The first sentence had not been heard; the patent had not been filed; the demonstration of the telephone at the Centennial Exposition had not been made. All these noteworthy events were to occur later in the year 1876. But already, at the beginning of the year, the basic principle of the new art had been discovered and Bell's experiments were approaching a successful issue.

The inventor of the telephone lived to see the telephone in daily use by millions all over the world and to see thousands of inventions and developments from his original discovery.

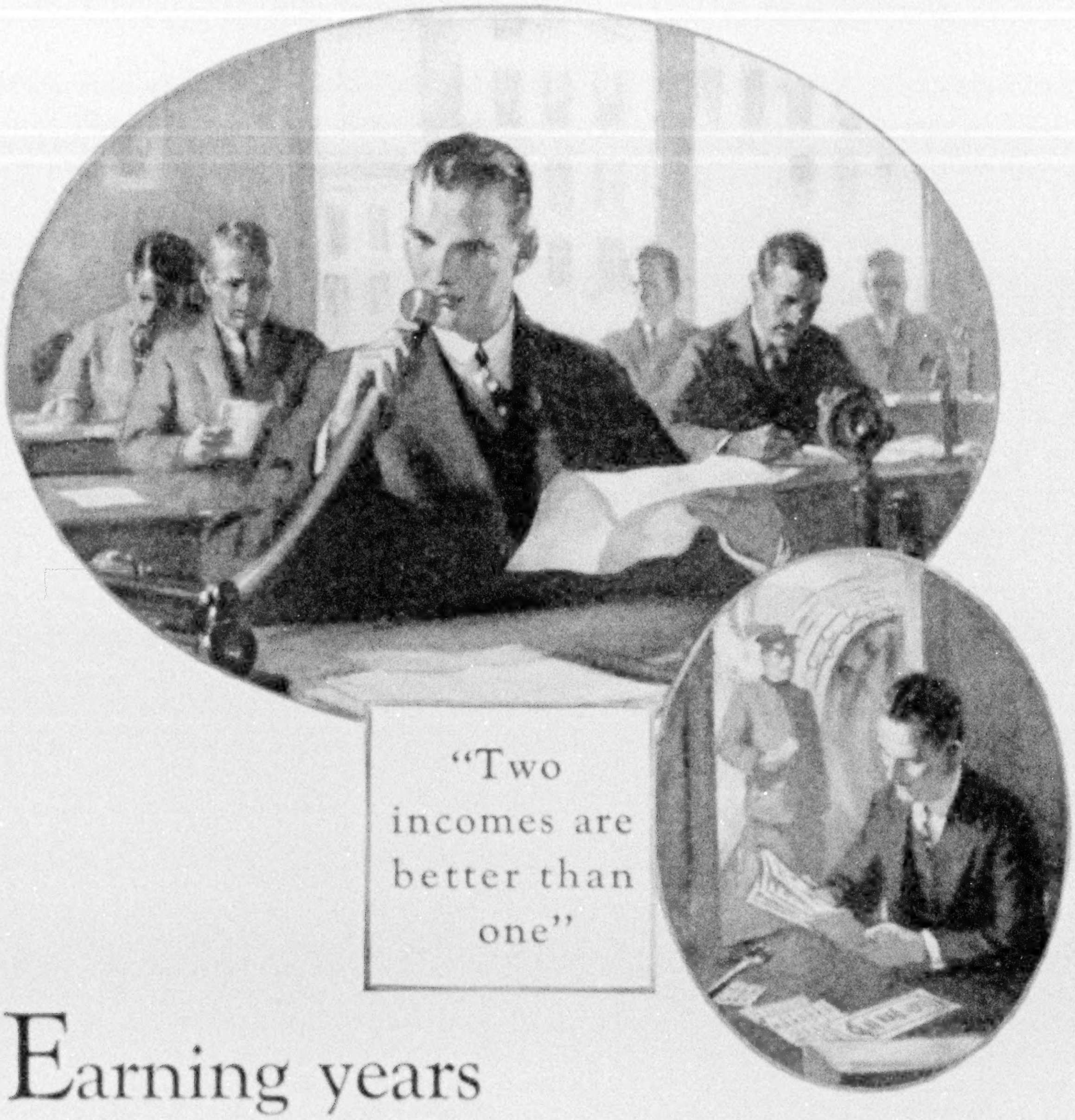
If he had lived to this semi-centennial year, he would have seen over 16,000,000 telephones linked by 40,000,000 miles of wire spanning the American continent and bringing the whole nation within intimate talking distance. He would have seen in the Bell System, which bears his name, perhaps the largest industrial organization in the world with nearly $3,000,000,000 worth of public-serving property, owned chiefly by an army of customers and employees.

He would have seen developed from the product of his brain a new art, binding together the thoughts and actions of a nation for the welfare of all the people.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

BELL SYSTEM

IN ITS SEMI-CENTENNIAL YEAR THE BELL SYSTEM LOOKS FORWARD TO CONTINUED PROGRESS IN TELEPHONE COMMUNICATION



"Two incomes are better than one"

Earning years should be investing years

PLAN for two incomes—one from salary, one from good bonds. Set aside a definite portion of the salary check regularly for bond investment and re-invest the income. Then, when emergencies arise or salary earnings cease, the bond income will be there to fall back upon.

Our offices in more than fifty leading cities are ready to help you work out a definite "get ahead" program and to recommend well-secured bonds suited to your needs.

THE NATIONAL CITY COMPANY

National City Bank Building, New York

BONDS · ACCEPTANCES
SHORT TERM NOTES

Offices in more than 50 leading cities throughout the world

USE THIS SOAP
SHAVING STICK
LATHER ON THE FACE
USING PLENTY OF WATER
Wms
SCREW RE
INTO OLD HO

Williams Holder Top Shaving Stick

The stick is held by a threaded metal ring—no chance of its working loose in the holder. Re-loads are equipped with this same ring, insuring a sure fit in the holder.

Its *LATHER* is famous—
and the *HOLDER holds*

AFTER all, even a perfect product isn't worth much to you if it isn't made in a form which suits itself to your convenience. Take Williams Shaving Stick, for instance. It gives the famous Williams lather—saturated with moisture—easy on the razor, easier on the skin; all that goes without saying. But it has another great advantage.

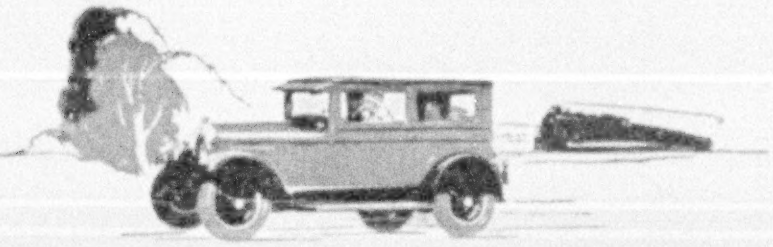
That is the Holder Top. The important feature of the Holder Top is the metal-to-metal grip which makes it impossible for the soap to work loose in the holder. Each Williams stick or re-load is made with a carefully threaded metal ring at its base. This ring engages with a corresponding thread in the Holder Top, so that there is no guesswork as to whether or not the stick will hold—no doubt as to its unscrewing cleanly and neatly when a re-load is necessary.

Don't expect to get Williams results from other shaving soaps. Williams stick works up quickly into a rich, bulky lather—so full of moisture that all of each hair becomes saturated with it. This means an easy job for the razor—it just glides along. Williams soothes the skin, leaving it glove-smooth, thoroughly conditioned.

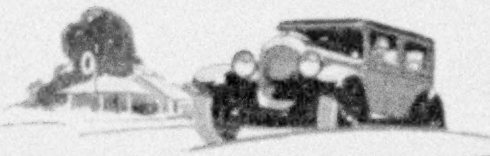
Three generations of specializing in shaving soap manufacture stand behind all Williams products. We make stick, cream, powder, tablet—four forms, one lather—Williams.

Aqua Velva is our newest triumph—a *scientific* after-shaving preparation. A few drops keep the face like velvet all day. We will send a 150-drop test bottle free. The J. B. Williams Co., Dept. 51, Glastonbury, Conn. If you live in Canada, address The J. B. Williams Co., St. Patrick Street, Montreal.

Williams



58 miles per Hour



25 miles to the Gallon

5 to 25 miles in 8 seconds

Measure Chrysler Four's performance and economy against investment and you will find no other car to match it.

Into Chrysler Four is built the ability for sustained speeds as great as 58 miles an hour—you flash from 5 to 25 miles an hour in 8 seconds—with an ease and smoothness you never thought possible for any car near the Chrysler Four price.

And with these startling performance results you enjoy a fuel economy as high as 25 miles to the gallon.

Never before have such outstanding qualities been blended with so much comfort and such beauty of appearance.

Our nearest dealer is eager to give you the Chrysler Four demonstration that will revise all your previous ideas of performance in a car at this price.

CHRYSLER FOUR—*Touring Car, $895; Club Coupe, $995; Coach, $1045; Sedan, $1095.*
Chrysler hydraulic four-wheel brakes at slight extra cost.

CHRYSLER SIX—*Phaeton, $1395; Coach, $1445; Roadster, $1625; Sedan, $1695; Royal Coupe, $1795; Brougham, $1865; Imperial, $1995; Crown Imperial, $2095.*

All prices f. o. b. Detroit, subject to current Federal excise tax.

Bodies by Fisher on all Chrysler enclosed models. All models equipped with full balloon tires.

There are Chrysler dealers and superior Chrysler service everywhere. All dealers are in position to extend the convenience of time-payments. Ask about Chrysler's attractive plan.

All Chrysler models are protected against theft by the Fedco patented car numbering system, exclusive with Chrysler, which cannot be counterfeited and cannot be altered or removed without conclusive evidence of tampering.

CHRYSLER SALES CORPORATION, DETROIT, MICHIGAN
CHRYSLER CORPORATION OF CANADA, LTD. WINDSOR, ONTARIO

CHRYSLER FOUR

Sparkling Spring Days-now

SPEND a month or so in Tucson, garden city of the Arizona Wonderland. Bring your clubs and have a glorious game of golf on sunshine-flooded greens. Mount a *real* pony and gallop across all out-doors. Visit Old Mexico, motor on inviting boulevards through fantastic, giant cactus forests. Spend a few weeks on a great cattle ranch. Open your heart to Tucson's eternal sunshine and really *live*.

Here Is Health

You'll like Tucson—it's a friendly place—the West of your dreams. Country and Town Clubs are open to visitors, hotels are excellent, cozy homes may be rented reasonably. Each winter hundreds of visitors, surfeited with cold and snow, come to Tucson just to enjoy the golden procession of warm, *dry*, sunny days. This is the place to play, rest or rebuild physically if you are suffering from "nerves", overwork, asthma or pulmonary infections.

Low Fares

Winter excursion rates effective via Rock Island and Southern Pacific Lines. Stop-overs on all tickets.

Mail the coupon for illustrated book telling about Tucson—the sunniest spot in America.

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Sunshine~Climate Club
ARIZONA

Tucson Sunshine-Climate Club,
504 Old Pueblo Bldg., Tucson, Arizona.
Please send me your free book, "Man-Building in the Sunshine-Climate."

*Name*________________________

*Address*________________________ 118

The Island of Enchantment

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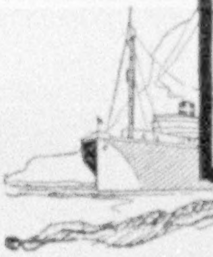

The glamour of Old-World cities, beautiful scenery and June-like climate. Interesting motor side trips without additional expense.

11 DAYS

all expenses $150 *and up*

Big, comfortable steamers (including new S. S. "Coamo," in service January, 1926) especially built for service in the Tropics. Weekly sailings. Wide range of accommodations.

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FLOWERS telegraphed for all occasions to any city, or delivered in New York $5.00 and up
Gift Baskets $10.00 and up

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The Telegraph Florist of New York
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By Cunard line, new oil burners

AROUND THE WORLD CRUISE

From N. Y. Jan. 20, from Los Angeles Feb. 5, 128 days, $1250 to $3000
Featuring 26 days, Japan and China, including Peking.

JAN. 30, MEDITERRANEAN CRUISE

62 days, $600 to $1700.
Featuring 15 days, Palestine and Egypt.

JUNE 30, 1926, NORWAY

and Western Mediterranean; 53 days, $550 to $1250.

Rates include hotels, drives, guides, fees. Originator of Around the World Cruises. Longest experienced cruise management. Established 30 years.

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Get your Kodak out

It's fun to Kodak and there's lasting pleasure in the pictures themselves. Those snapshots of little Jane, for example, will mean more and more to you every time you open the album.

Autographic Kodaks, $5 up

Eastman Kodak Company, Rochester, N. Y., *The Kodak City*

"Gosh! I'm not a baby any more!"

When your boy flashes out with an angry outburst like this, you see only wilfulness. In your anxious care and fond desire he sees only—continual "Don'ts" and "Stops."

A boy in his teens is going through his most trying years. True, he needs restraint, but what he needs most is strong leadership—leadership he will accept.

To give growing boys the guiding hand they need has been the successful achievement of THE AMERICAN BOY for twenty-five years. This it does through stories of adventure in which your boy sees fellows like himself winning out through pluck and self-reliance. He sees the results of meanness, loyalty, dishonesty, clean-mindedness.

THE AMERICAN BOY does not preach. Its stories are not juvenile or patronizing. The foremost writers of the day, who contribute to THE AMERICAN BOY, not only know and love boys, but they know how to sugar-coat the pill of instruction so boys will take it, with a smile.

Give your son the companionship of THE AMERICAN BOY. Help him appreciate fair play, hard work, back-bone. Give him a year's subscription. Subscribe for that other boy you'd like to see get ahead. Mail the coupon today.

$2.00 a year by mail. 20c the copy at all news-stands. Subscribe for a year or leave a standing order at your news-dealer's.

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THE SPRAGUE PUBLISHING CO.
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Enclosed find $2.00, for which send THE AMERICAN BOY for one year, beginning with the current issue, to

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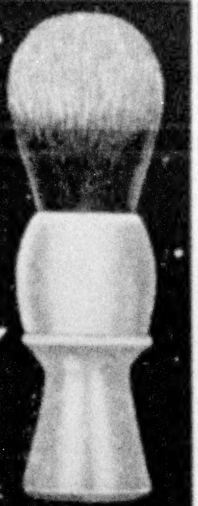
Canada $2.25 Foreign $2.50



BRISTLES OR BADGER HAIR

When you select a Shaving Brush for its *"business end"* it will of course be a WHITING-ADAMS

VULCAN RUBBER CEMENTED

WHITING-ADAMS Shaving Brushes are made from selected bristles and Badger Hair only. The "business end" of every Whiting-Adams brush is full and bushy, carries a copious lather that works in easily and softens the beard quickly. Naturally the bristles "stay put"—that's expected.

Every hair is permanently imbedded in hard rubber—

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BOSTON
Brush Manufacturers for 117 years and the largest in the World

In Displaying Color Prints You Get Harmony by Using

Moore Push-Pins
Glass Heads—Steel Points

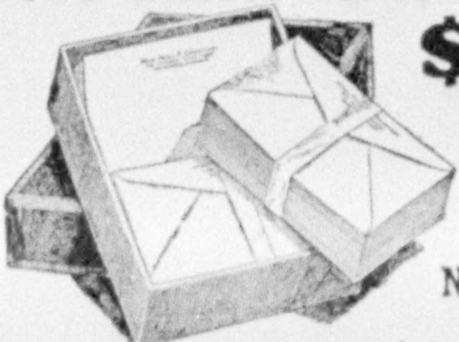
To Hang Heavy Articles on Walls or Woodwork Use

Moore Push-less Hangers
Scientifically Constructed for Strength

Tool-tempered steel points insure safety and will not injure plaster or woodwork.

10c Pkts. Everywhere

Moore Push-Pin Co., Philadelphia, Pa.
Manufacturers of Colored Map Tacks



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$1.00
Post Paid

High grade, clear white bond paper—unusually smooth writing surface. Size 6x7 inches with envelopes to match. Has that crisp, crackly "feel" that identifies it to everyone as superior quality stationery.

Name and Address Printed Free

on every sheet and envelope in rich dark blue, up to 4 lines. Type is Plate Gothic, designed especially for clearness and good taste. Makes a personal stationery you will be delighted to use. An ideal gift with your friend's name. Attractive 3 letter monogram if preferred.

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Do you want bigger profits in 1926? Then consider this fact: Thousands of men, in every line of business, have made bigger profits this year by using the Burroughs Simplified Accounting Plan. With this same plan thousands more will increase their profits in 1926. Will you be one of them?

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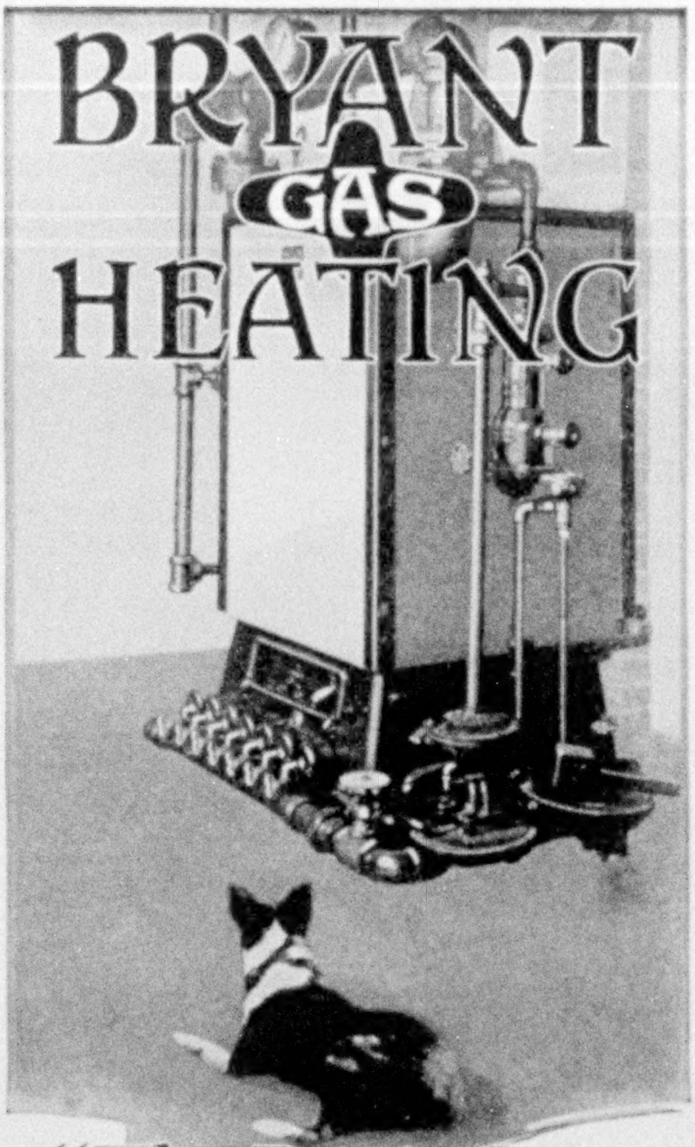
ADDING · BOOKKEEPING · CALCULATING AND BILLING MACHINES



"The Pup's Our Furnace Man"

Gas will free you from all heating troubles. With no more care than a pup can give it, a good gas heating plant keeps the home warm and comfortable all winter.

No over-heating nor under-heating! Absolute freedom to come and go as you please! No soot, ashes nor odors—no coal man—no ash man!

The incomparable convenience, comfort and cleanliness of automatic gas heating are now well-within reach of most home owners—even where gas prices are not the lowest. Write for booklet of gas heating information.

THE BRYANT HEATER & MFG. CO.
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Branches in 21 Principal Cities

It almost seems as if you just couldn't have a wedding without Crane's Kid Finish—it is used so universally for the announcements and invitations. Weddings demand the finest quality in every detail and, for its purpose, Crane's Kid Finish is the finest paper in the world.

As are all Crane's Writing Papers. Not only for weddings but for every occasion, where paper should express the social standing and personality of the writer, there is a Crane paper of faultless style and superlative quality.

Crane's Writing Papers

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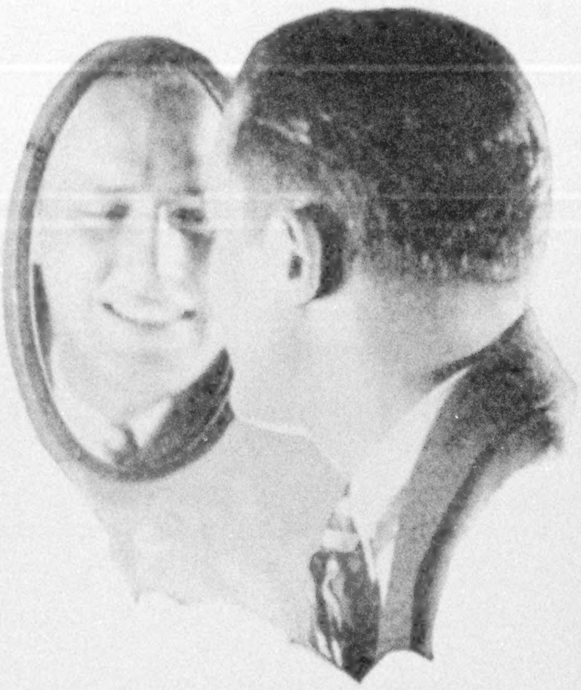
The visiting cards of husband and wife must match in the engraving style, color of the engraving and the shade of the cards. Crane's Satin Finish or Crane's Kid Finish, extra super-fine quality, in pearl grey shade, is the standard for correctness.

EATON, CRANE & PIKE CO., 225 Fifth Ave., New York

FREE 10-Day Tube
MAIL THE COUPON



No "off-color" teeth

—no toneless gums

when that dingy film is removed

Accept this remarkable dental test. You'll gain the dazzling white teeth and coral-like gums that make smiles *attractive and inviting*

MODERN dental science has made important, recent discoveries in lightening cloudy teeth. In a few days you can work great changes in the color of your teeth; can give them dazzling whiteness and your gums the healthy coral tint you envy.

If you seek new beauty and new charm, test this new way. Do as millions are doing on dental advice. Multiply the value of your smile. Mail the coupon. A 10-day test will be sent you.

Beneath the film are gleaming, glorious teeth

Run your tongue across your teeth, and you will feel a film, a viscous coat that covers them.

That film is an enemy to your teeth—and your gums. You must remove it.

It clings to teeth, gets into crevices and stays. It absorbs discolorations and gives your teeth that cloudy, "off-color" look.

Germs by the millions breed in it and lay your teeth open to decay. And they, with tartar, are a chief cause of pyorrhea and gum disorders.

Tooth troubles and gum troubles now are largely traced to that film.

Old-time methods fail in successfully combating it. *That's why, regardless of the care you take now, your teeth remain unattractive.*

New methods remove it. And Firm the Gums

Now, in a new-type dentifrice called Pepsodent, dental science has discovered effective combatants. Their action is to curdle the film and remove it, then to firm the gums.

Ordinary methods fail in these results. Thus the world has turned, largely on dental advice, to this new method.

What you see when that film is removed—the whiteness of your teeth—will amaze you. You are simply hiding the natural beauty of your teeth.

A few days' use will prove its power beyond all doubt. Mail the coupon. A ten-day tube will be sent you free.

FILM the worst enemy to teeth

You can feel it with your tongue

FREE Mail this for 10-Day Tube to

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Name ....

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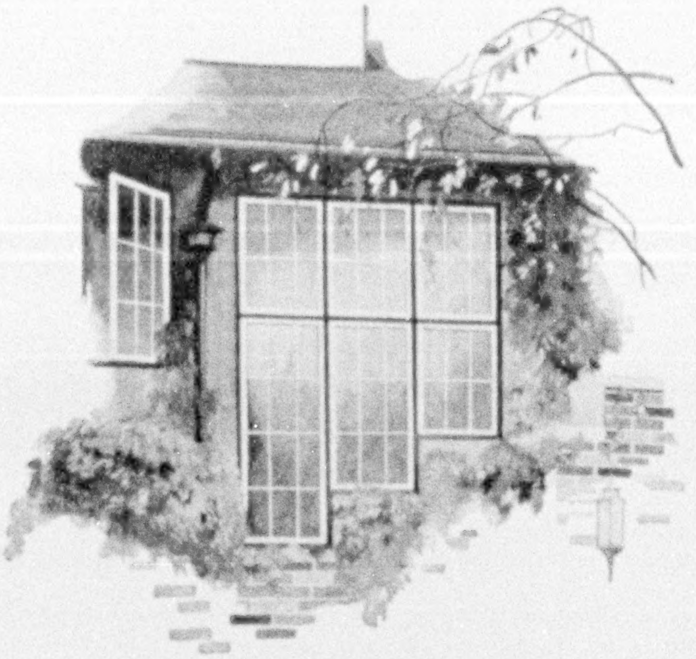
Only one tube to a family. 1967

Canadian Office and Laboratories:
191 George Street, Toronto, Canada



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Not a fanciful statement, but an architectural fact!

Steel casements, handsome in their slim outlines and rugged strength provide a picturesque exterior wholly in accord with a charming, comfortable interior.

From the outside their graceful leaded panes suggest the hospitable atmosphere within. Inside they admit more light and air and add tone to all interior furnishings.

Reswin Casements are both beautiful and practical. They are *guaranteed* weatherproof, whether they open in or out. And their cost is only slightly in excess of commonplace wood windows.

Our catalog, free on request, shows how easily Reswin Casements may be screened, washed and draped.

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CASEMENTS
Standardized Steel Windows

Look Inside the Piano for this TradeMark

WESSELL, NICKEL & GROSS
NEW YORK
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Will *Your* Piano Be a Quality Instrument?

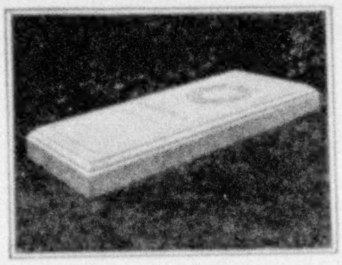
IT IS *bound* to be if you take care to select a make containing the famous Wessell, Nickel & Gross piano action. For this fine action is never found in a piano of doubtful worth.

The *piano* action is the piano's most vital part. It controls tone and touch. It must be delicately responsive, yet built to stand years of usage.

The Wessell, Nickel & Gross action is made by the oldest, largest and leading makers of high-grade piano actions. It is the *world's highest-priced piano action.* It is today the choice of America's leading piano makers—and has been since 1874.

WESSELL, NICKEL & GROSS
Established 1874 New York City

When you Buy an Upright, Grand, Player or Reproducing Piano—Insist on the Wessell, Nickel & Gross Piano Action.



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I HAVE put the results of my lifework in originating and growing gladioli into my 1926 book. It tells you why Kunderd Gladioli stand supreme. Contains my personal cultural directions and describes my new "Wonder Mixture." Write for it now so you can have plenty of time to choose the Kunderd Gladioli you will want for your garden next summer. Address

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Kunderd *Gladioli*
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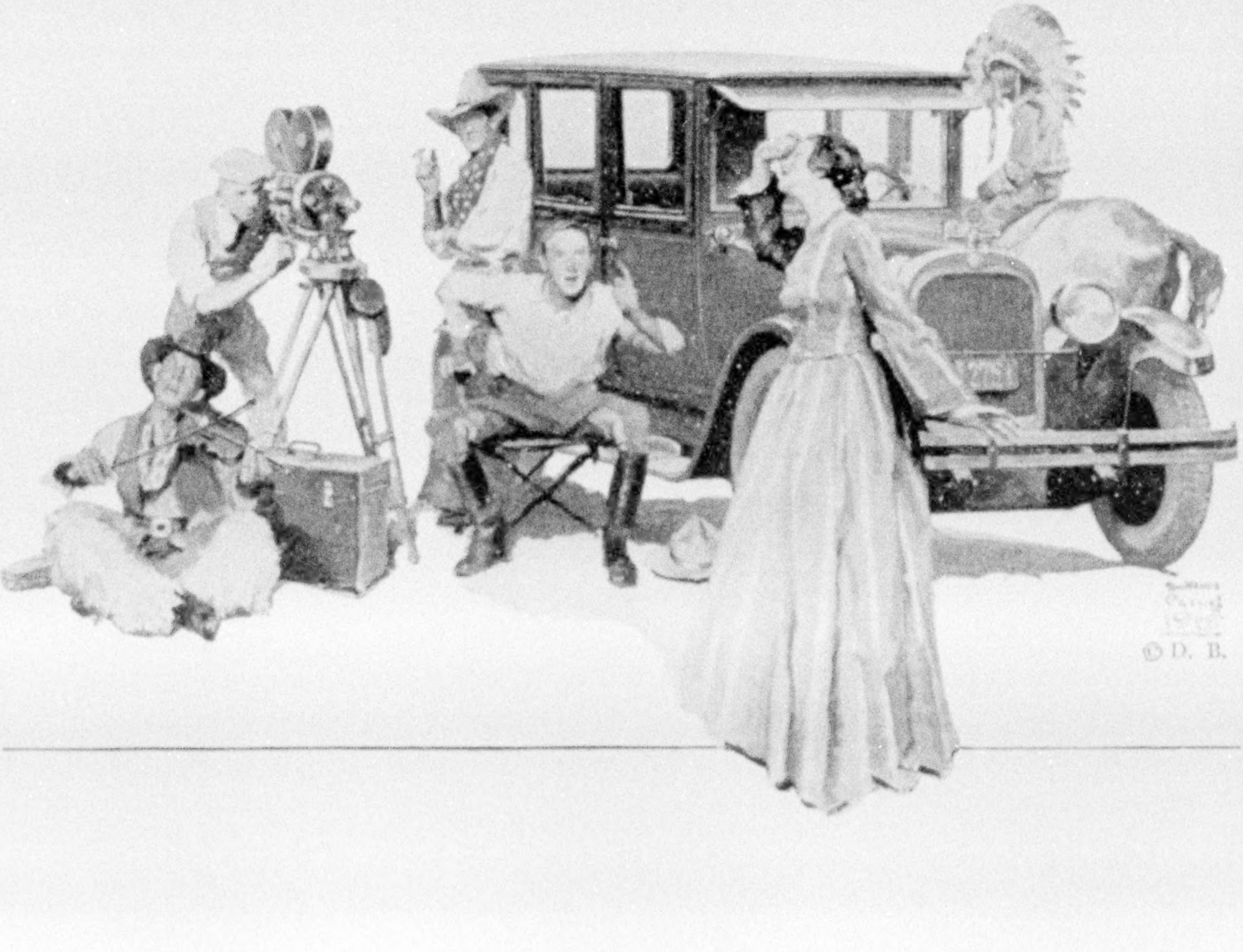
You find it driven by the very rich and by the moderately well-to-do.

It appears to equal advantage at smart social affairs, or employed in the practical business of every day.

Its refinement naturally attracts fastidious buyers.

Its dependability is valued by those who value their time and whose time has value.

Ask your dealer about Dodge Brothers New Credit-Purchase Plan



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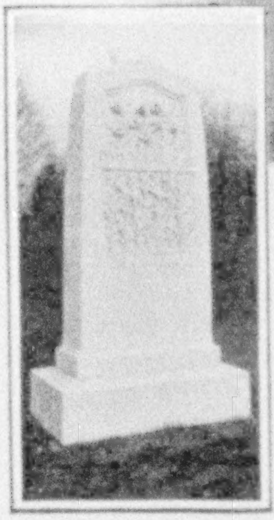
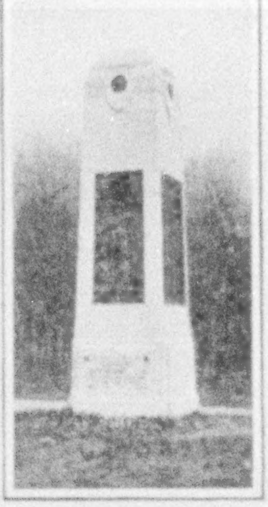


Benedum Mausoleum, Stony Creek Granite, Pittsburgh, Pa.



Whether it be a Mausoleum, a tribute to our Soldier dead or a private Memorial there is needed that finer touch of skilled craftsmanship upon superior granites to portray the real art in the design. This is typical of Dodds' service in master Memorials.

Mark every grave

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Occupation ....
(This information is important for the records.)

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for membership in The Society.

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Name and Address of Nominating Member

1-26

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THEORY, AND EACH STUDENT IS
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Who fear caffeine

There is a coffee with the caffeine taken out. A coffee all may drink at any hour and to their hearts' content.

Not mock coffee, but real coffee—a rare and delightful blend. We simply open the pores and remove the caffeine. That is the source of all coffee's harm.

Caffeine is tasteless and odorless. Its removal does not affect the flavor or aroma in the least.

This coffee is called Kaffee Hag. The finest hotels now serve it. In countless homes it is the favorite brand.

Learn what it means to you and yours. A coffee you need never fear or stint. A coffee you can drink at night and sleep.

This coupon with a dime will bring a 10-cup package to you. Get it for some coffee lover who cannot drink caffeine. Clip coupon now.

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10 Cups for 10c

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takes movies
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Using FILMO *Automatic*

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The FILMO Camera is light in weight, compact, and easy to carry as a still camera. As simple to use as a spyglass. No tripod necessary. No cranking. Economical. Pressing a button takes the pictures automatically. Pictures you take may be shown on wall or screen with the FILMO electrically operated Projector. The highest quality equipment obtainable. Designed and built by the Bell & Howell Co., who supply 95% of the professional cameras and equipment used in studios the world over. Sold by better dealers.

Write for descriptive booklet, "What You See, You Get."

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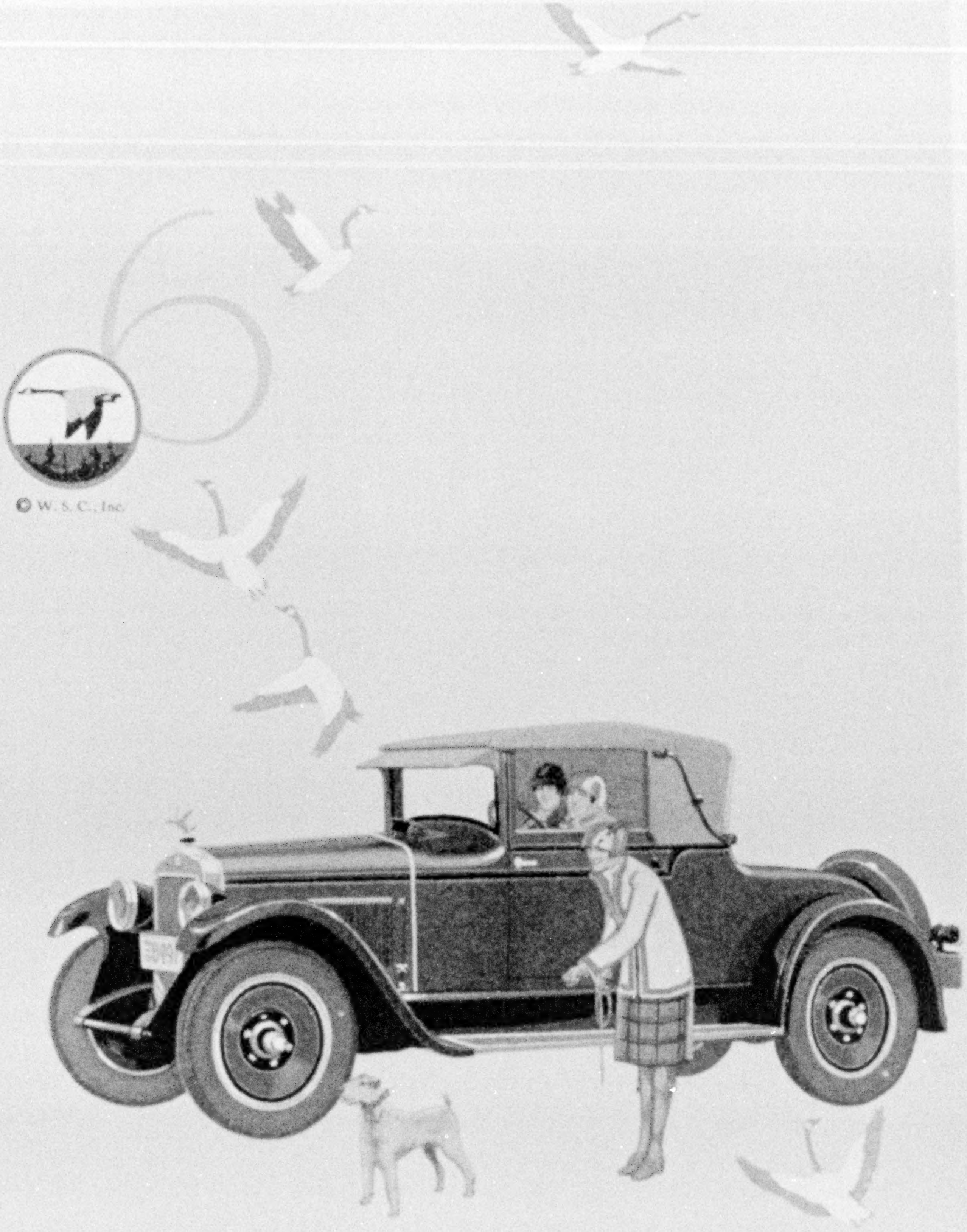

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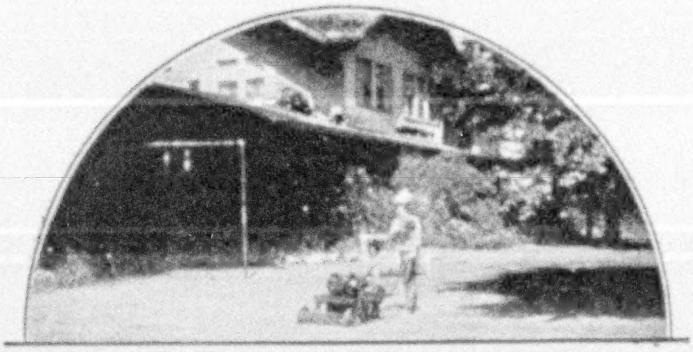

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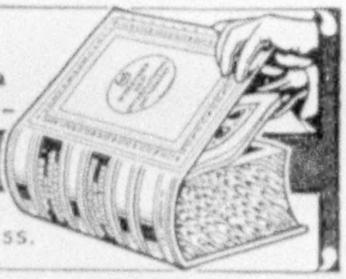

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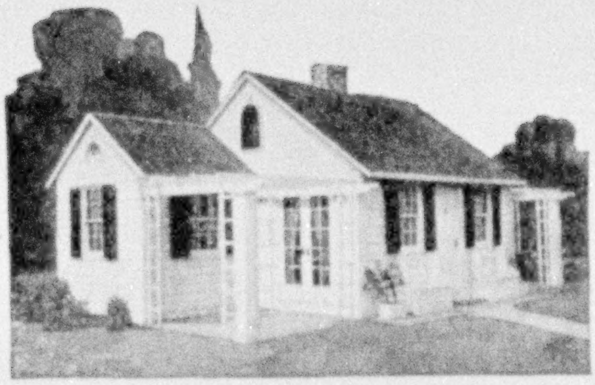

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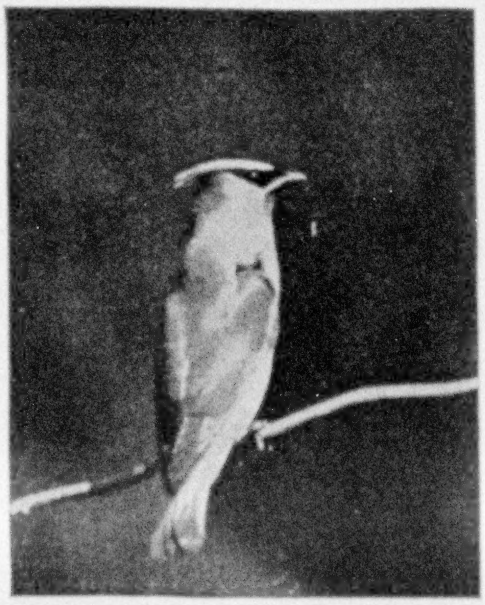

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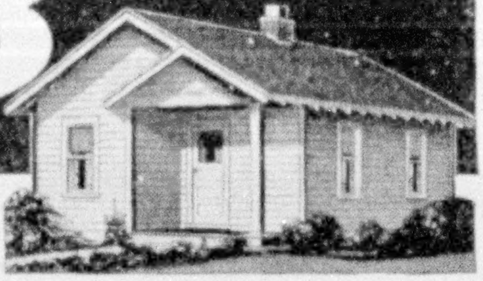

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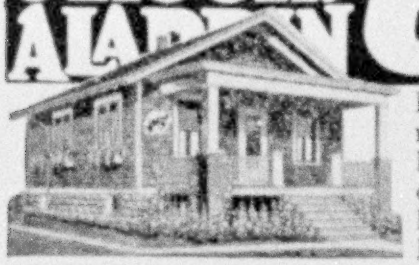

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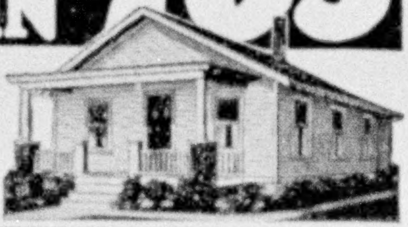

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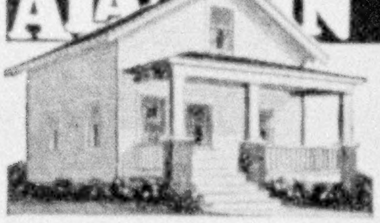

Story and a half semi-bungalow, with second floor available for 2 bedrooms. 2 floor plan arrangements. Any handy man can erect these houses.

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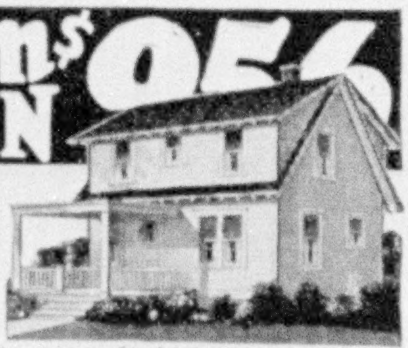

Price includes all lumber cut to fit; highest grade interior woodwork, siding, flooring, windows, doors, glass, paint, hardware, nails, lath, roofing, with complete instructions and drawings. **Freight paid** to your station. Permanent Homes—NOT PORTABLE. Many styles of year 'round dwellings, summer cottages and garages to choose from. **Write nearest mill today for FREE Money-Saving Catalog No. 1485.**

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A unit because of the mutual underwriting

Total assets on Sept. 30th, $1,059,486,378.11

IN LESS THAN eight years of actual operation, the twelve Federal Land Banks have grown into a billion dollar organization! Since the Bonds issued by each Bank are underwritten by all the other Federal Land Banks, the entire system may be regarded as a single unit—*the largest Farm Mortgage organization in the world.*

The statement of September 30th (forwarded on request) shows 370,876 mortgages averaging $3,073 each, held on improved farms in all parts of the country. The Total Assets were $1,059,486,378.11; the Total Capital, $52,783,832.50; Reserve, $7,650,528.23; Undivided Profits, $5,262,239.00. The monthly earnings are now substantially in excess of $700,000.

These figures represent a conservative valuation. Every piece of land acquired through foreclosure has been charged off; no such item is carried as an admitted asset. Likewise, every installment payment over 90 days past due is charged off until collected, and it does not appear as an admitted asset.

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"A Standard Form of Investment"

so stabilized as to find a ready market with as little fluctuation in prices as Government Bonds

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3. The constant purging of assets through the writing off of foreclosed mortgages and past due installments.
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Congress has declared that these Bonds are "instrumentalities of the Government of the United States". As such the Bonds and the interest received from them are exempt from all "Federal, State, Municipal and local taxation", including personal and corporate income taxes. This provision has been affirmed by the U. S. Supreme Court.

Federal Land Bank Bonds are eligible for the investment of all fiduciary and trust funds under Federal administration. They are also acceptable at par as security for all public deposits including Postal Savings.

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Write today for Federal Farm Loan Board Circular No. 16 descriptive of these Bonds, addressing nearest Federal Land Bank or

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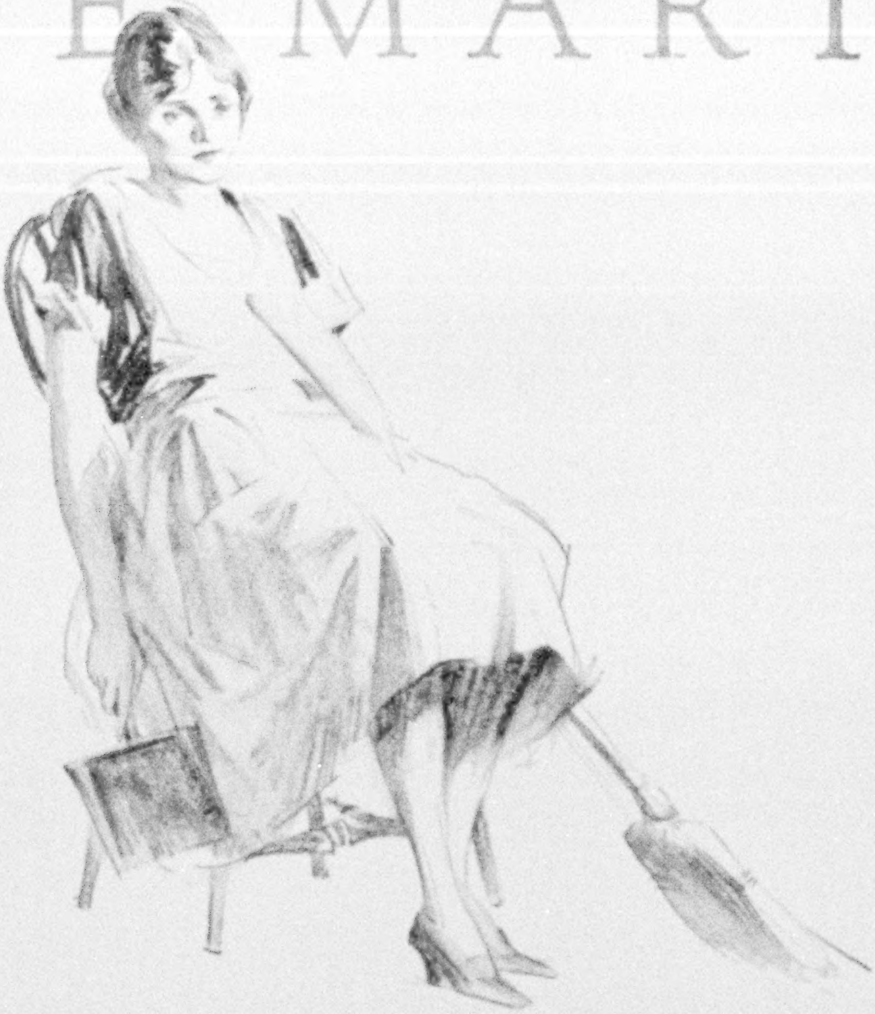
THE MARTYR



MARTYR to a "lost cause" is the woman who strives for cleanliness with carpet beater, broom and dust-cloth.

Though she invest her every ounce of strength, her every hour of time, how far from satisfactory are the results!

For much of the dangerous, destructive dirt which ruins her rugs still lies embedded deep in the nap after each sweeping.

The age of brooms and carpet beaters long is past!

In their place has come The Hoover — Servant to the Home — that *your* home and that of every housewife may be kept immaculately clean.

While it saves even more of your strength and time than do most cleaners, The Hoover also saves your rugs.

Unlike any other cleaner, it provides you *every cleaning method that you need* in order to make your rugs wear longer and retain their beauty.

As you glide it easily, slowly, back and forth, The Hoover *beats* your rugs — and rugs *need* beating, as you can prove*. . .

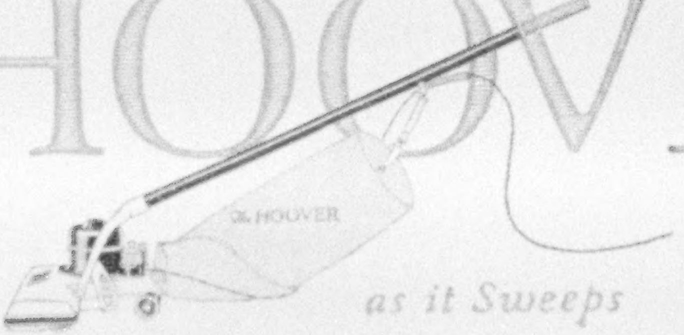
It *sweeps* your rugs, and *suction-cleans.* Its remarkable dusting tools do all your dusting, *dustlessly.*

With ease and speed your tasks are *thoroughly* accomplished. There is time for leisure; and the cleanliness of your home is an endless source of pride.

Own a Hoover! For *only* $6.25 *down* any Authorized Hoover Dealer will make delivery, *complete.* See him today!

*TO PROVE RUGS NEED BEATING: Turn over a corner of a rug; with the handle of an ordinary table-knife, or something of equal weight, give the under or warp side 15 to 25 sharp *taps* and watch the dirt dance out from the nap depths onto a piece of paper. Feel the destructive character of this grit. This is the dirt your present cleaning methods have missed, *and that beating has dislodged.* Correct use of The Hoover causes this embedded dirt to be *vibrated* to the surface by the rapid, gentle *beating* of the Hoover brush, as powerful suction *lifts* the rug from the floor and draws all the beaten-out, swept-up dirt into the dust-tight bag

The HOOVER



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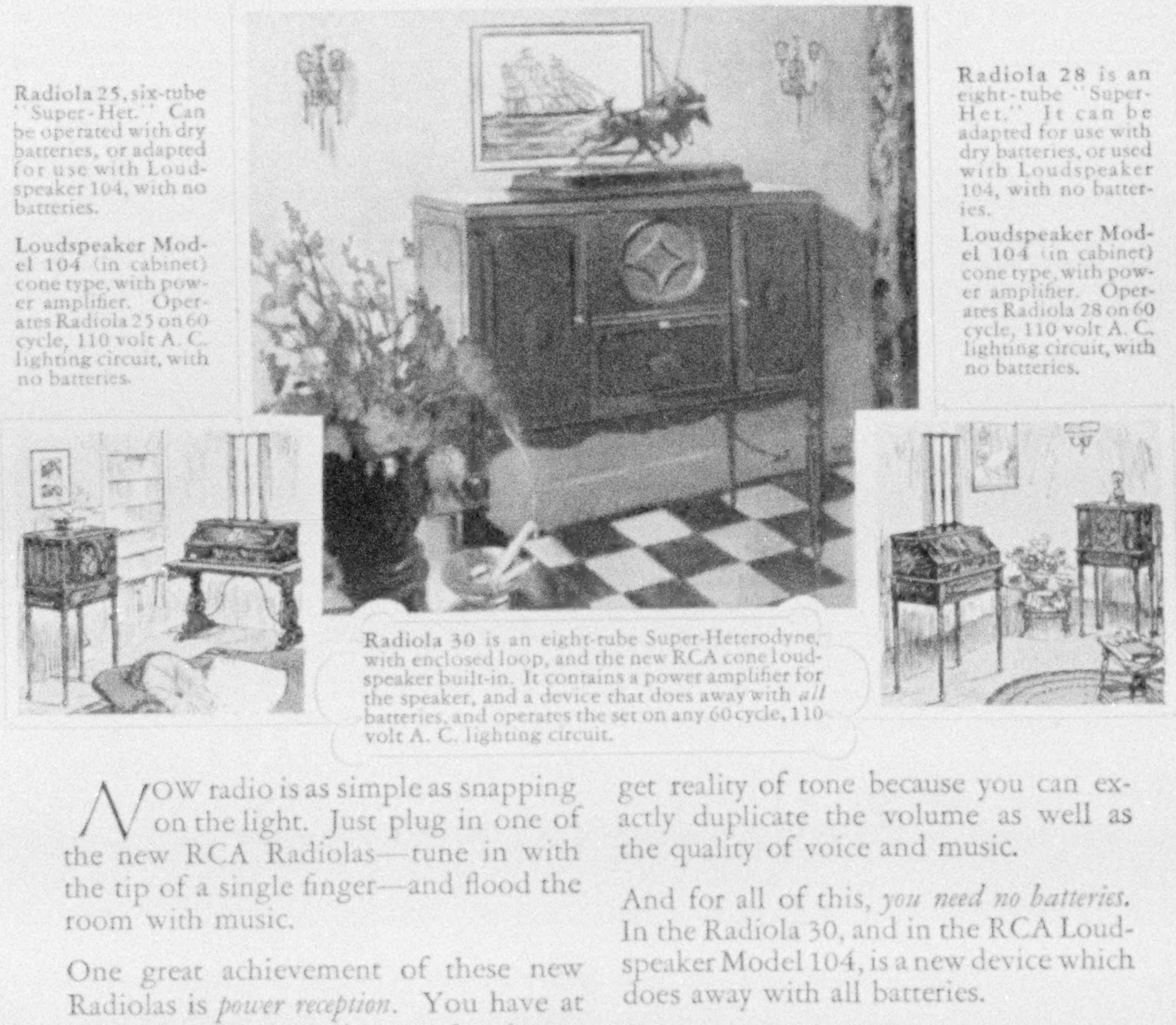
Radiola Super-Heterodynes that use no antenna and no batteries



Radiola 25, six-tube "Super-Het." Can be operated with dry batteries, or adapted for use with Loudspeaker 104, with no batteries.

Loudspeaker Model 104 (in cabinet) cone type, with power amplifier. Operates Radiola 25 on 60 cycle, 110 volt A. C. lighting circuit, with no batteries.

Radiola 28 is an eight-tube "Super-Het." It can be adapted for use with dry batteries, or used with Loudspeaker 104, with no batteries.

Loudspeaker Model 104 (in cabinet) cone type, with power amplifier. Operates Radiola 28 on 60 cycle, 110 volt A. C. lighting circuit, with no batteries.

Radiola 30 is an eight-tube Super-Heterodyne, with enclosed loop, and the new RCA cone loudspeaker built-in. It contains a power amplifier for the speaker, and a device that does away with *all* batteries, and operates the set on any 60 cycle, 110 volt A. C. lighting circuit.

NOW radio is as simple as snapping on the light. Just plug in one of the new RCA Radiolas—tune in with the tip of a single finger—and flood the room with music.

One great achievement of these new Radiolas is *power reception*. You have at your command, undistorted volume. With the newest Super-Heterodynes and an RCA power loudspeaker, you can get an orchestra loud and true enough to dance to in a crowded hall. You can get reality of tone because you can exactly duplicate the volume as well as the quality of voice and music.

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The man who today buys a six or eight-tube Super-Heterodyne with RCA power speaker and A. C. operation is making a permanent investment for years of joyful listening in!

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